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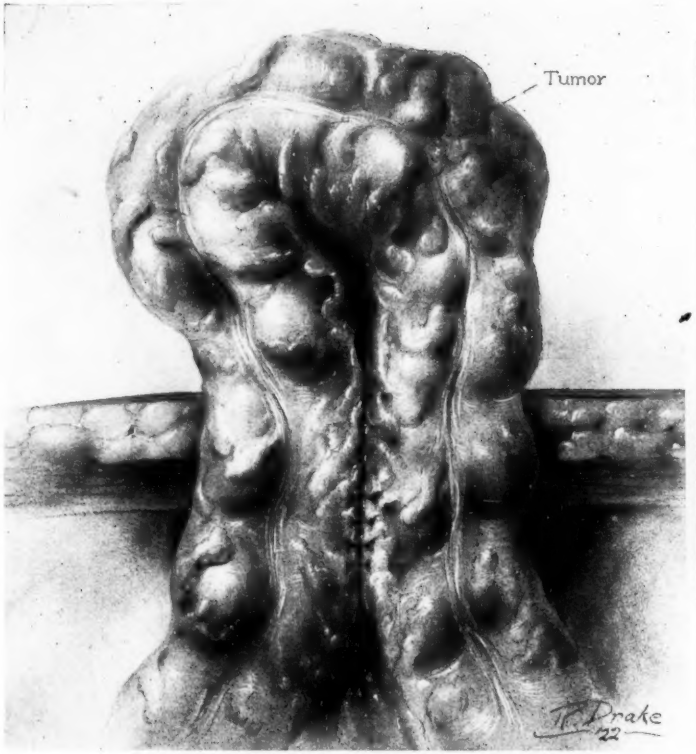

Fig. 1. Bowel looped out of wound and sutured together.

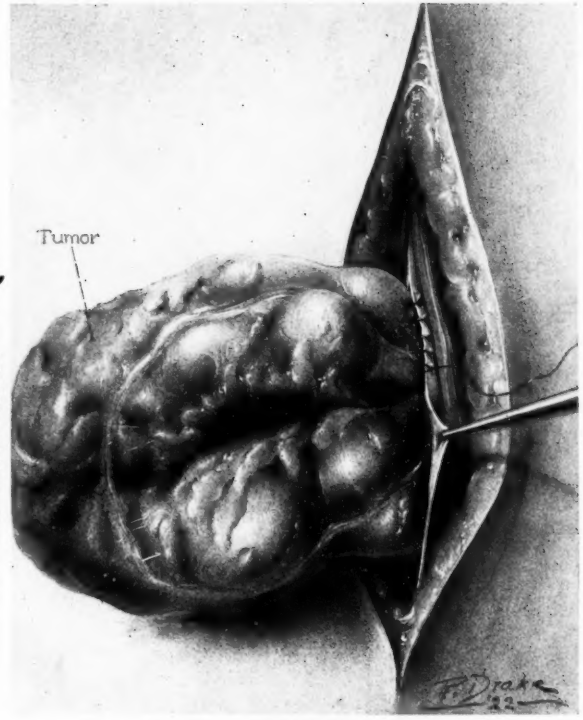

Fig. 2. Suturing the bowel to peritoneum and fascia.

The Two-Stage Mikulicz Operation for Cancer of the Sigmoid. — *Charles H. Mayo and Waltman Walters.*

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THE TWO-STAGE MIKULICZ OPERATION FOR CANCER OF THE SIGMOID

BY CHARLES H. MAYO, M.D., F.A.C.S., AND WALTMAN WALTERS, M.D., ROCHESTER, MINNESOTA
Mayo Clinic

DESCRIPTIONS of the two-stage Mikulicz method of removing cancer of the sigmoid and descending colon are singularly lacking in the standard textbooks of surgery, yet few operations for cancer of the large intestine are simpler, have a lower mortality rate, or offer so good a chance of complete cure. Particularly is this true since experience has developed improved technical methods, greatly reducing the mortality and extending operability.

A discussion of the comparative value of various types of operation should be based on the operability, mortality, permanency of cure, and morbidity.

End-to-end or lateral anastomosis in a one-stage operation has given excellent results, both immediate and remote, in selected cases, in which the patient is in good condition, with little if any obstruction, and in which the mesosigmoid does not contain a large amount of fat, so that the peritoneum will readily close the mesenteric gap, leaving no non-peritonized spaces at the site of anastomosis. If a primary operation is performed, a tube should be passed from the anus through the lower end of the cut intestine extending 10 or 12 inches above the anastomosis. A large stomach tube which makes a curve, rather than a kink, is the most efficient. This prevents hardened masses of fæces from exerting pressure on the suture line from gas distention. Primary resection, usually the tube method of Balfour, has been applicable in but sixteen of such cases admitted to St. Mary's Hospital during the last 4 years.

It was found in the Clinic that any attempt to go beyond the indications of primary operation has resulted in a high mortality; the patient develops late peritonitis and progressive sepsis, which results in pulmonary complications. Consequently there was a tendency to reduce operability very greatly. Unfortunately, the large majority of patients with cancer of the large intestine are in the last decades of life, in poor general condition, not infrequently obese, and often have more or less intestinal obstruction.

Operability. Improvements in technical methods extend operability without increasing mortality. Certain patients are alive and well today in whom two or three separate loops of small intestine were adherent to the growth, requiring simultaneous resection. Several of these patients also had portions of the bladder removed. One such patient is alive now, 12 years after such a multiple operation. Not infrequently it was found necessary to remove the uterus with the ovaries and tubes because of their involvement. The extent to which these operations have been carried, when there was no glandular or peritoneal metastasis, has indeed been very great. Most interesting in this connec-

tion are several cases in which the left ureter was hopelessly involved in the growth, and a section excised, the two ends of the ureter being tied with silk, the kidney on that side undergoing passive atrophy without subsequent symptoms.

Mortality and permanency of cure. The septic contents of the colon invite peritonitis, but the two-stage method of Mikulicz, by permitting peritoneal adhesions to form before the lumen of the intestine has been opened, has greatly reduced mortality, especially if obstruction exists. Between the years 1909 and 1920 inclusive, this type of operation was performed in the Mayo Clinic on 152 patients with cancer of the sigmoid and rectosigmoid. All but 8 of these patients were traced; the 8 are therefore eliminated from the statistics, although in our experience, those patients not heard from show a higher average of recovery, as pointed out also by Bloodgood.

Fifty-two of the patients are living and well with normal, functioning gastro-intestinal tracts and no evidence of recurrence. An additional 37 patients have had from 2 to 7 years of postoperative life, death occurring in many instances from conditions not connected with the cancer of the sigmoid. In this connection it is well to remember that the normal death rate of persons 52 years of age, the average age of the patients in this series, is 2 per cent a year, so that the patients who have died cannot definitely be said to have died from a recurrence of the disease. These statistics are valuable if for no other purpose than to promote a more optimistic feeling in the profession with regard to the cure of cancer by operation, and to counteract the pessimism engendered by many recent articles on the cure of cancer. These end-results support the splendid work of the Society for the Prevention and Cure of Cancer.

Morbidity. The history of various standard operations constantly shows a reduction of disability. The best of many operations of equal mortality rate, when tested by the gauge of disability, is the one which gets the patient up and to work in the shortest possible time. In this particular, when subjected to scrutiny, the two-stage method of Mikulicz shows delayed healing with a total period of disability of from 4 to 8 weeks or longer, occasionally followed by hernia, usually not of serious grade, which can be repaired, and occasionally by a small fistula which is slow to close.

Technique. Hernia can be obviated at the time the colostomy opening, which has been left open, is closed. As the inner wall of the intestine is united, the attached ends can be dissected down deeply into the adhesions which have not disappeared, and the anastomosed ends sunk well below the muscles and sutured transversely, while the wound is sutured longitudinally. A gap should be left in the suture line of the abdominal wall sufficient to permit the escape of gas and fæces under pressure. If the gap in the abdominal wound is filled with vaseline, free drainage is permitted, if necessary, without interfering with primary healing.

It is very important when the forceps are put on, to bite out the spur, making a large enough opening to prevent tension on the suture line. In a considerable percentage of cases there is an escape of gas and fæces from the incision at the end of the first week, but this usually subsides readily. We have tried constipating patients following the closure of the colonic opening, and also the early use of laxatives. On the whole a middle course has been found most satisfactory.

Since the adoption of the method of sinking the intestine well below the level of muscle, no fistulæ have formed. Formerly the edges of skin and mucous membrane of the colon were not widely separated, and the button method of closure was used.

The high regard for the two-stage method of Mikulicz gives it a dignified position in surgery. The various steps of the operation as published by W. J. Mayo in 1907 are as follows:

"Resection for obstruction between the splenic flexure and the rectum should usually be made in two stages on account of the solid nature and septic character of the fæces, and the lack in many cases in this region of a good peritoneal covering. The cause of the obstruction is most frequently new-growth, or extensive inflammatory disease such as di-

Fig. 3. Crushing forceps in place.

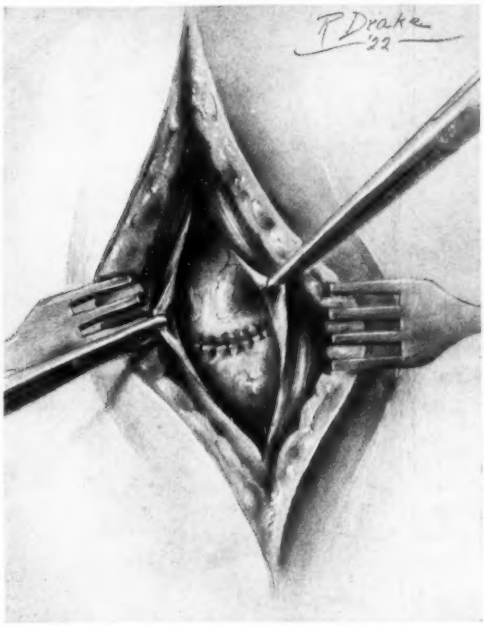

Fig. 4. Last stage showing the closure of the bowel.

verticulitis. Immediate end-to-end or lateral union may be advisable when there is no obstruction, especially in that part more completely invested with peritoneum, but if there is obstruction the complete primary operation is often fatal. It is far better to follow the method of Mikulicz as introduced and early practiced by C. H. Mayo, which consists in drawing the affected part out of the abdomen after separating the mesentery and suturing the two limbs together (Fig. 1), attaching it to the abdominal incision with the diseased part projecting beyond the skin (Fig. 2.) After waiting as long as the condition of the patient will permit for adhesions to protect the wound, the obstruction may be relieved by a small opening in the distended loop. In from 4 to 8 days, the entire projecting area is cut away, leaving the two ends of the colon flush with the skin, side by side like a double-barreled shot gun. At the end of 2 weeks a long bladed forceps is introduced, one blade in each opening, and made to grasp the opposed walls of the intestine where they are held by sutures for a distance of not less than 8.75 centimeters (Fig. 3). The clamps are gradually tightened until they cut their way through, which takes from 4 to 6 days; sometimes the forceps bite may be short and may have to be repeated. This re-establishes the communication. The fistula gradually contracts and will either close itself, or can readily be closed by a secondary extraperitoneal operation."

This classical description is so complete that little needs to be added. Certain modifications have extended the scope of the operation to a group of cases which, heretofore, have been considered hopeless. One of the serious objections to this operation in the earlier days was the fact that the bowel was allowed to heal in the wound before being opened, and therefore in acutely obstructed cases the two-stage operation was regarded unfavorably. Paul, of Liverpool, modified the operation by cutting out the tumor at the first operation, and leaving the proximal end of the colon about 7.5 centimeters long, in which a tube was fastened to conduct the contents to a container. Bevan justly calls attention to the safety of a primary colostomy, showing that if the bowel is carefully sutured into the

wound, it can be safely opened at once without danger of infecting the peritoneal cavity.

It has been the practice in the Clinic to remove the portion of the bowel containing the tumor at the primary operation whenever it could not be elevated above the incision, or its circulation was so seriously interfered with that gangrene was to be expected, as it was noted in certain of these cases that septic thrombi progressed deeply, resulting in peritonitis. Also if the lower fragment is very short, the growth is cut away at once. The two ends of the bowel are then clamped, the clamp on the lower part being used as a temporary elevator, and left in place until it comes away itself, by which time the lower fragment has attached itself with sufficient strength to remain in the lower angle of the wound. In a number of instances in which the cancer was very low in the sigmoid, the entire rectum was loosened up to the levator ani muscle, and by the forceps method, the upper end of the rectum was maintained in position, the peritoneum of the lower pelvis being obliterated by sutures, and a pack of vaseline iodoform gauze introduced about the forceps. The space in the hollow of the sacrum was drained by a right lateral stab wound. An opening can be made in the proximal fragment above the clamp at any time to relieve the pressure of gas, and so forth. Ultimate closure of the sigmoid ends is made extraperitoneally, or if necessary, by the tube method of Balfour (Fig. 4).

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INTRAMENINGEAL DIVISION OF THE SPINAL ACCESSORY AND ROOTS OF THE UPPER CERVICAL NERVES FOR THE TREATMENT OF SPASMODIC TORTICOLLIS

By KENNETH G. McKENZIE, M.B., Toronto
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THE treatment of spasmodic torticollis, surgical or otherwise, has always been difficult and unsatisfactory. The French physician Rabelais in the sixteenth century was familiar with the malady and probably first used the term torticollis. He is said to have stated: "I hate these people worse than death." No doubt he was exaggerating his feelings, but most surgeons even today dread to see a case of intractable torticollis enter the clinic. In view of this fact, any new ideas or procedures regarding the treatment of the disorder should be welcomed.

It is the main purpose of this paper to describe what we believe to be a hitherto untried operative procedure, which has given a large measure of relief to a patient afflicted with spasmodic torticollis.

P. B. B. H. Surgical No. 18028. The patient, Mrs. D., a married woman 51 years of age, consulted Dr. Cushing, January 19, 1923. She complained of her head being drawn to the right, and such severe pain in the right suboccipital region that life was becoming unbearable.

History. About 5 years previously she first became conscious of a fine tremor of her head, which persisted and became increasingly noticeable, especially when she was overtired. There probably was a certain amount of spasm even during this early period because she had noticed for at least 3 years that the right sternomastoid was becoming prominent; also by that time (3 years ago), a spasmodic pain in the right suboccipital region was becoming her chief complaint.

Painful spasms in the muscles on the right side of the neck, during which her occiput has become more and more drawn down to the right, have since then steadily increased in frequency and intensity. Fortunately these spasms largely disappeared on recumbency and did not interfere with her sleep. They did, however, interfere greatly with her usual activities, and of late she had been unable to sit up for more than a few minutes at a time without the occurrence of a most painful rhythmic spasm with its accompanying malposition of the head. Consequently, for the past several months she has directed practically all her household duties from a couch, getting up for only a few minutes at a time.

Examination. The patient was a vigorous woman, who attempted to be cheerful in spite of her malady, and in whom there were apparently no neurotic stigmata. While lying in bed, she seemed to be quite comfortable, and the only symptoms noticeable were a slight tilting of the head to the right and a definite enlargement of the right sternomastoid. On sitting up, however, a fine tremor of the head simulating the senile type immediately became noticeable; then in a moment or two the head would be jerked spasmodically toward the right shoulder with the chin rotated to the left (Fig. 1). So long as she was erect the muscles never relaxed, and the head was persistently held by an increasingly painful spasm. Though she could relieve the tension in some degree by supporting the head with her hand, the pain became unendurable and she soon had to lie down to get relief.

It was quite impossible to single out all the individual muscles affected; the right sternomastoid stood out prominently, and so far as one could judge all of the right posterior group were also in a state of contraction.

A general physical and complete neurological examination was quite negative. There was no nystagmus; no visual disturbance; the blood and urine were negative.

There was no doubt about the severity of the malady, and any surgical measure which might relieve her disability was worthy of consideration.

Operation. January 13, 1923 (Dr. Cushing). *A combined cerebellar and upper cord exposure with intrameningeal division of the spinal accessory and posterior and anterior roots of the upper three cervical nerves on the right side.*

The patient was placed in the usual cerebellar position and an incision marked out which would permit exposure of the upper cervical and right suboccipital regions. The flap was reflected to the right, care being taken to keep the vertical incision in the median line to minimize hæmorrhage. The spines and laminæ of the upper three vertebræ were identified and removed without difficulty. About as much of the occipital bone was removed as is shown in the operative sketch (Fig. 3).

The dura was opened over the right cerebellar region and down the length of the laminectomy. Through the intact transparent arachnoid, it was possible to see the nerve roots and the spinal accessory. The arachnoid was then opened and the fluid allowed to escape. When that was done, the spinal accessory was followed up to its point of exit at the jugular foramen and divided. In turn the

Fig. 1 (left). Patient during active spasm—before operation.
Fig. 2. Patient 8 months after operation. The photograph fails to show the tremor and the fact that some of the occipital muscles are in slight hypertension.

sensory and motor roots of the first, second, and third nerves on the right side were hooked up and divided at their point of entrance into the dura. The dentate ligament was also divided, and the cord rolled to the side to make sure that the divisions were complete. There was slight bleeding on dividing the second cervical, which was the largest of these roots, and it was necessary to implant a bit of muscle to control hæmorrhage. The wound was left dry and was closed in layers, with fine silk sutures. The usual cerebellar crinoline dressing was applied but with no attempt at fixation or over correction. The patient left the table in good condition.

Postoperative notes. Shortly after recovering from the anæsthetic, the patient could talk only in a whisper. When examined the next day a weakness of the right palate and vocal cord was noted. It was thought that either the glossopharyngeal and vagus had been slightly injured or that some of the fibers of the spinal accessory were in this case motor to the palate and vocal cord. These disturbing symptoms disappeared within a few days.

At the end of 2 weeks, she was allowed to sit up in bed and the marked improvement in her condition was for the first time apparent. The painful and spasmodic malpositions of the head had disappeared though the fine tremor persisted apparently unchanged.

At the end of 3 weeks, she was up and about. A satisfactory convalescence continued and she was discharged 6 weeks after the operation with no return of the pain or spasm.

Subsequent notes. A number of letters were received, all of them indicating that she had experienced great relief. On September 22, 1923, 8 months after the operation, she reported in person. She looked well, was most cheerful, and expressed herself as gratified with the results of the operation. She had been completely free from the former spasms and able to be on her feet and to do her own housework as in former days. Though the head was held in good position (Fig. 2), free from its former twist, the fine tremor nevertheless was still present. This she stated was aggravated by fatigue. Her voice had regained its normal timbre.

There was complete paralysis and atrophy of the right sternomastoid, weakness and atrophy of the upper trapezius, with slight drooping of the shoulder. The right splenius, however, stood out with some prominence and appeared to be in mild spasm; also the posterior muscles on the other side of the neck gave one the impression of being in slightly increased tonus. No doubt the deeper muscles on the right supplied by the first, second, and third nerves were paralyzed (though it was impossible to tell this by palpation) leaving the partly paralyzed splenius under control of the lower cervical nerves.

At the present time, a year after the operation, her condition remains the same, and the procedure may be considered to have been successful beyond expectations. However, knowing the tendency of this intractable malady to spread, it is not impossible that we are dealing with an arrest rather than a cure.

In any discussion of torticollis it is necessary at the outset to get a clear idea of what is meant by the term. Here we shall not deal with the so-called congenital torticollis seen in children and due (1) to some skeletal defect such as an extra wedge-shaped vertebra; and (2) to a definite shortening of the sternomastoid resulting from fibrous tissue

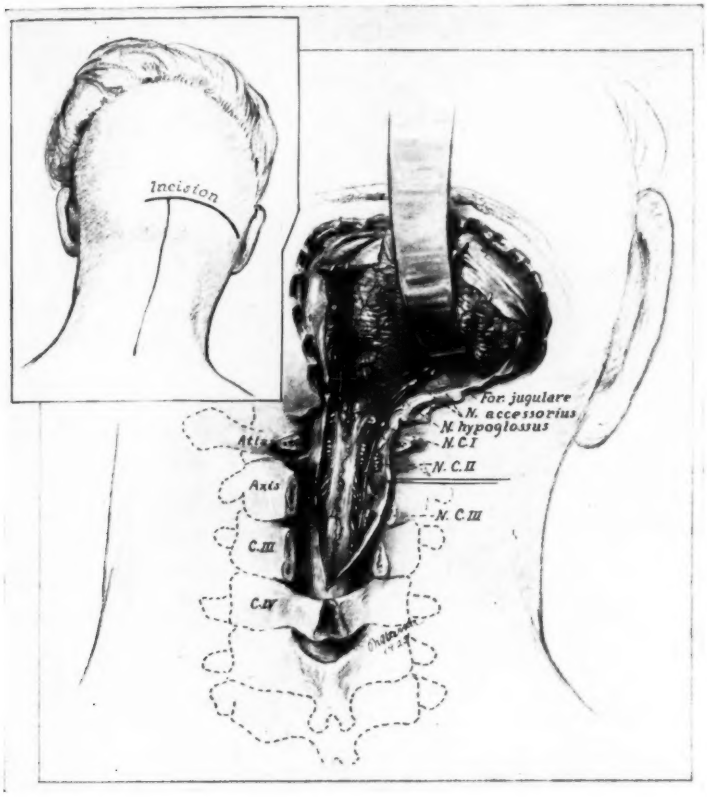

Fig. 3. Drawing showing line of incision and exposure of nerve roots.

formation caused in various ways by injury to the muscle.

Apart from the congenital group, René Cruchet (1) in his treatise published in 1907 distinguishes the following eight varieties which occur later on in life and in which no definite pathological changes have been found:

1. Neuralgic torticollis,
2. Rhythmic torticollis,
3. Paralytic torticollis,
4. Cervical torticollis,
5. Professional torticollis,
6. Frank spasmodic torticollis unaccompanied by pain,
7. Habit torticollis,
8. Mental torticollis.

As we interpret his definitions of these varieties, we would have difficulty in placing the case just reported in any of the groups, but feel that the term "painful spasmodic torticollis of unknown origin" is most suitable.

SURGICAL TREATMENT

Before considering the operative procedures which have been hitherto practised, it is well to refresh one's memory of the muscles concerned and also of their mechanical action.

The insertion of these muscles is shown in the accompanying sketch (Fig. 4) of the base of the skull. In addition the obliquus capitis inferior, which is not shown, arises from the axis and is inserted into the atlas, and is a strong rotator of the head. These muscles may be divided into four groups, the two sternomastoids being the only muscles of size

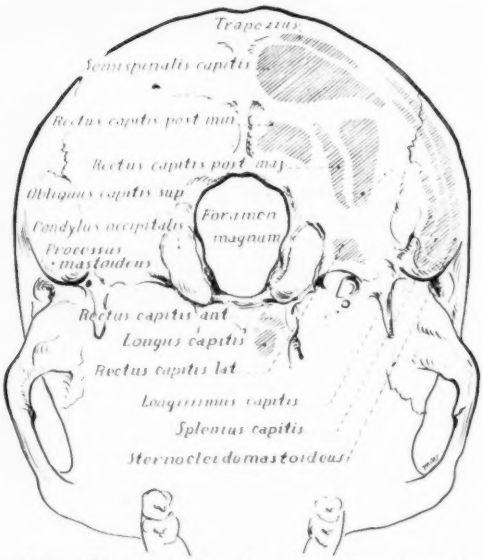

Fig. 4. Diagram to show the places of insertion in the base of the skull of the rotary muscles.

with an anterior attachment, while the remainder make up the posterior group.

As the mechanical action of these four groups is somewhat confusing, the accompanying diagram (Fig. 5) may be helpful.

It can be seen at a glance that tilting and rotation of the head may be in various directions depending not only on the groups involved but also on their relative degree of spasm. For example: *A* and *D* together would tilt the head to the right, but if *D* were exerting a greater pull than *A* the head would be not only tilted to the right but also rotated to the left, as in the case reported. These groups may be involved singly or in any combination, although Richards and Walton (2) state that in their experience it was more usual for the sternomastoid of one side and the posterior group on the opposite side to be involved. These two groups would act together in rotating the head but not in tilting it to one side.

Having pointed out the mechanical action and the possible combinations of group spasm which may occur, it is clear that a very careful examination is necessary, so that the group combination may be determined and in this way the surgical treatment properly directed. In the case reported, it was necessary to plan an operation to relieve the spasm in two groups on the same side, a combination which possibly is rather uncommon.

Because of the ease with which the sternomastoids may be seen and examined, they are looked upon as the chief offenders more often than is warranted, and surgical treatment has commonly been directed toward them alone. But it has gradually become recognized that more extensive procedures are often necessary. Indeed, the disability may be so great that any operative procedure, no matter how formidable, is worthy of consideration if it offers any hope of relief.

The operations hitherto practised have been based on the following principles: (1) to paralyze a muscle or group of muscles by section of their motor nerve supply; and (2) to destroy the function of the muscle by division of the muscle itself.

It is apparent that any type of operation based on these principles is limited; obviously, one must not destroy the function of all the muscles supporting the head. Also in the type of operation performed on the case here reported, the procedure was necessarily restricted to the upper three roots for fear of injury to the phrenic nerve.

It occurred to the writer in considering these surgical measures and the intraspinal operation here reported to suggest another procedure, one which might stop spasm without paralyzing or completely destroying the function of the muscles. Such a method, theoretically at least, seems possible when certain physiological principles are considered.

Sherrington (3) states: "In decerebrate rigidity the tonic rigidity of a muscle is maintained when all the nerves to the limb have been severed excepting the nerves of the muscle itself. The rigidity of the muscle immediately ceases on severance of the spinal afferent roots through which pass the afferent fibers from the muscle."

Based on this principle, considerable work has been done on section of the posterior roots for the relief of spasm in certain neurological conditions, especially Little's disease. A number of cases have been collected (4 and

5), and certain of the results so far as the relief of spasm is concerned are quite striking.

It remains then to suggest that the muscle spasm, as seen in torticollis, may be effectively relieved by section limited to the posterior roots. But in considering such a type of operation it is to be noted that division lower down than the sixth would cause anæsthesia of the fingers. It is obvious then that all of the afferent fibers from—say the splenius—could not be divided, as they probably enter by all of the cervical and the upper two or three thoracic posterior roots.

The question then arises, would section of some or most of the afferent fibers from any muscle diminish its spasm? There does not appear to be any direct experimental evidence on this point. In the experiments we have been able to look up, all of the afferent fibers were divided, and not part, as would necessarily be the case with the splenius capitus. In discussing this point with Professor Forbes of Harvard, he stated: "It is my impression that the decerebrate rigidity of any given muscle would diminish in proportion to the number of afferent fibers divided." If this be the case, and it is a point which should be open to experimental proof, the spasm of the splenius might be definitely lessened, if not completely abolished, by section of the upper five or six posterior roots. What has been said with regard to the splenius is also applicable to the other long muscles concerned, namely the semispinalis capitis and longissimus capitis.

It would, of course, still be necessary to divide the spinal accessory, as the afferent fibers from the sternomastoid travel in this nerve, and do not enter the cord by the posterior roots.

It is interesting to speculate regarding the active movements which would remain after a bilateral section of the upper six posterior roots. Sherrington (5) quotes the two following experiments:

(1) The afferent roots of the fifth, sixth, seventh, eighth right cervical, and the right first thoracic nerves, were severed. Marked ataxia of the right forelimbs ensued, with obvious weakness of the right forearm. (2) In a similar experiment, the fifth root was not cut, and the resultant ataxia and weakness was distinctly less than in experiment 1.

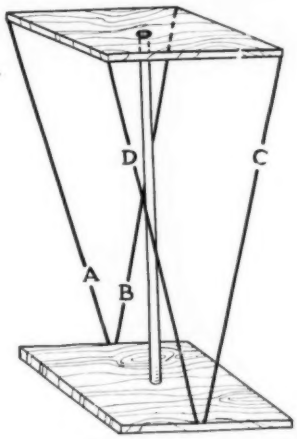

Fig. 5. Diagram illustrating the action of the four groups of muscles in tilting and rotating the head. *D* and *C* represent the sternomastoids and *A* and *B* the two posterior groups.

It may therefore be assumed that in a bilateral section of the upper six roots in the neck the movements would be weak and ataxic. How this ataxia would affect the posterior-muscle groups which support the head, and which are possibly controlled in part at least by the impulses from the special senses as well as by common sensation, is a question which cannot now be answered.

SUMMARY

1. A case of spasmodic torticollis, operated on by Dr. Cushing, is here reported. Intrameningeal division of the right spinal accessory, together with the combined trunk for each of the three upper right cervical segments was performed. Great improvement followed the operation.

2. Intraspinal division of the posterior roots only of the upper cervical nerves, leaving the anterior roots intact, is suggested. It is thought that by this means the spasm in the posterior muscles, as seen in torticollis, could be markedly diminished, if it could not be entirely abolished, and that the weak active function of these muscles would still be retained.

At the time Dr. McKenzie put this paper together for publication, we were unaware of any other attempt to treat a case of this sort by intrameningeal neurectomies. The subject was brought up at a meeting of the Society of Neurological Surgeons, Boston, December, 1923, at which time Dr. A. S. Taylor recalled a case which he had operated upon. Through a hemilaminectomy of the upper three cervical vertebræ he divided the posterior roots of the upper four cervical nerves on the corresponding side. The condition was improved (3 months). The case was briefly mentioned in Johnson's *Operative Therapeusis*, vol. i, p. 535. Both Dr. Taylor and Dr. McKenzie fail, I think, to take the spinal accessory sufficiently into consideration.

My attention has since been called by Dr. Charles E. Dowman to a fact which I had entirely forgotten: namely, that 20 years ago (1902) at the Johns Hopkins I operated upon a woman in whom torticollis had developed after typhoid fever. It was a bilateral case and by high cervical laminectomy the second cervical nerve on the left side was divided intraduraly and also the sensory fibers on the opposite side were divided. She received a certain measure of relief on the left side but the symptoms returned on the right associated with a good deal of pain. In April, 1922, Dr. Dandy resected the spinal accessory of this same patient on both sides of the neck without appreciable effect. It is quite probable that a number of these intraspinal procedures may have been thus half-heartedly undertaken in days gone by and may not have been reported because they resulted in no appreciable benefit.

HARVEY CUSHING.

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THYROCARDIACS: THEIR DIAGNOSTIC DIFFICULTIES: THEIR SURGICAL TREATMENT

A RELATIVELY NEW FIELD FOR SURGERY

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DURING the past 10 to 15 years there have been extraordinary advances in diagnosis and surgical treatment of thyroid disease. This has resulted in the organization in general surgical clinics of departments particularly equipped for the care and study of thyroid cases. Thanks to such an organization at the New England Deaconess Hospital, we have been able to establish a preliminary routine examination of such a character as to differentiate safely the confusing cases of fatigue or neurosis simulating hyperthyroidism but in reality not of thyroid origin, from those of true thyroid origin. In nearly all cases of hyperthyroidism we have been able to effect relief of clinical symptoms by operation and to confirm this by laboratory tests at repeated follow-up visits; and to keep the mortality of the total operative cases always below 1 per cent.

As a part of the expansion of the systematic handling of thyroid cases the special study and treatment of cardiovascular problems, ever present among the toxic cases, has been taken up in the clinic during the past few years. Before this surgery had been denied to a not inconsiderable number of cases; for example, some of the older cases with persistently irregular heart, and with varying degrees of disability up to complete invalidism with persistent congestive heart failure (decompensation) were considered practically hopeless—too dangerous as operative risks and too far gone for hope of improvement even though they might survive operation.

Many of these cases disabled by heart disorder were atypical in the signs of hyperthyroidism and superficially appeared to be disabled solely by heart disease. The gradual development of greater clinical accuracy in diagnosis, together with the development of more satisfactory methods in the preparation for operation, selection of the type of operation, the postoperative care, and the many other details of proper surgical management of thyroid cases, has resulted in the successful operative treatment of many such bothersome and untempting risks. The results most fortunately have been better than could possibly have been anticipated.

The effects of thyroid intoxication upon the heart differ greatly. In young individuals with previously undamaged hearts there appears to be no cardiac changes, no matter how intense the degree of thyroid toxicity. In these cases hyperthyroidism can exist up to the point of complete disability and even death, with no true signs of heart failure or variations from the normal in the heart findings except for rapid rate.

On the other hand, hyperthyroidism picks out many of the older patients, particularly those with previously damaged hearts, and produces profound cardiac effects.

The first significant sign in these cases is the sudden onset of a completely disorderly heart beat, auricular fibrillation. The onset of such an attack may date from an exacerbation of the thyroidism, from an intercurrent infection or from a mechanical strain. A very common time for the first occurrence of auricular fibrillation is in association with an exacerbation of toxic symptoms during the 48 hours following operation. So consistently does this occur in certain types of individuals that it is possible to prophesy pre-operatively with reasonable accuracy in what cases auricular fibrillation may occur following operation upon the thyroid. These first attacks are nearly always transient, and patients who are cured of their hyperthyroidism at this stage of heart affection nearly always have no more attacks.

We have learned, however, that hyperthyroidism if allowed to continue in patients who have been subject to transient attacks of auricular fibrillation, tends to result in the establishment of permanent auricular fibrillation. Some of our cases have had this persistent absolute disorder of the heart beat for months and even years before coming to us. And in many such cases where the burden of hyperthyroidism, on a heart thus embarrassed by auricular fibrillation, continues, the result may be heart failure, perhaps in a transient attack, but more surely in a slow progressive state of failure resulting at last in complete bedridden disability. These "thyrocardiacs," with which this paper deals, thus represent the end-results of untreated hyperthyroidism in certain individual cases. We wish to emphasize the fact that they are not simply severely toxic hyperthyroidism cases with auricular fibrillation and disability but have gone beyond this state and show the actual gross signs of true heart failure of the congestive type as described in the following paragraph.

DIAGNOSIS

These cases as they have come to the clinic present the classical picture of the congestive type of heart failure. They are sitting upright, breathing rapidly and noisily, with lungs full of râles, sometimes expectorating blood-tinged mucus, the neck veins are full, the liver is markedly engorged, oftener than not they are dropsical to the waist and some have also œdema of the thoracic wall and upper extremities.

The diagnosis of hyperthyroidism in this group of cases with congestive heart failure, is by no means as simple as in thyroid cases uncomplicated by heart failure.

If the very obvious features of hyperthyroidism, such as goiter and exophthalmos together with a typical past history of hyperthyroidism are present in a patient with cardiac decompensation, the diagnosis of a thyrocardiac state may not be difficult. But such clear-cut cases are rare in our series.

The diagnosis of hyperthyroidism in general hinges largely upon a high basal metabolism rate, and elevation of the metabolism rate has been persistently present in all of our thyrocardiacs; but the nature of basal metabolism tests demands that where they are used as final evidence of underlying hyperthyroidism, especially in these decompensated cases, the readings should be taken repeatedly, and that they be taken after acute decompensation is relieved as much as possible.

For example, an occasional cardiac case has suggested hyperthyroidism and given several successive high basal metabolism readings, when further investigation has shown a drop to normal and no hyperthyroidism. One patient continued to have high basal metabolism readings and decompensation (this case had a suggestively large thyroid and several secondary symptoms suggesting hyperthyroidism to confuse us) and proved on investigation to have an underlying chronic

nephritis with kidney failure which caused the cardiac decompensation.

Persistently and truly elevated basal metabolism rate is then essential to the positive diagnosis. Again, woeful error may follow an uncritical faith in high readings.

Rapid heart rate is almost an essential accompaniment of high basal metabolism and, therefore, should be present with every positive diagnosis of hyperthyroidism. But nearly every one of our cases has had prolonged rest in bed before final diagnosis, and this tends to slow heart rates appreciably even in definitely toxic cases. Also all but one case had auricular fibrillation, and even where hyperthyroidism and decompensation are present the heart rate may be lowered when auricular fibrillation is present and proper doses of digitalis are given. These facts may result in a deceptively quieted pulse in very toxic individuals when the patient is seen only under rest conditions, not even making the slight exertion necessary to being up and about a hospital room.

Thyroid enlargement is seldom present to help the diagnosis. The thyroid has been found in this group of cases, either of the small multiple adenomatous type or the small primary hyperthyroidism type. In several cases the thyroid has been found enlarged, or has been very much smaller than normal. This finding was very difficult for us at first to reconcile to our clinical ideas of hyperthyroidism and we hesitated a long time before we operated upon the first cases, but in view of other findings, particularly persistently elevated metabolism rate, we operated upon a number of such cases with a resulting drop to normal of the basal metabolism, and with a surprising and intensely gratifying relief of disability. In but one of our cases was the thyroid large and that one was of the diffuse colloid type.

The consistency of these small thyroids is firm and fibrous in character. They are never of the soft, full, and vascular type, so commonly seen in cases of primary hyperthyroidism of short standing and in comparatively young people.

There are many secondary signs in which the typical thyrocardiacs have differed from cases not yet complicated by heart failure. They are not activated as are the typical hyperthyroidism cases but as we see them they apparently have gone beyond the tormented excited phase of hyperthyroidism to physical and mental exhaustion. This mental and physical hebetude is a common and impressive symptom, not always present.

Tremor is often conspicuously absent.

Emaciation, often under a cloak of œdema, is the rule, but is not present in every case.

They usually show a uniform dark pigmentation of the skin.

They give the impression of being years older than their actual age; and do actually average older by about 15 years than the uncomplicated hyperthyroidism cases, but the age limits of the group are wide.

It is easily seen that no hard and fast rules for the infallible recognition and diagnosis of thyrocardiacs can be laid down. Intimate experience with a large number of these cases and their diagnostic peculiarities makes it relatively easy to suspect and confirm the suspicion.

Since these cases must be, and our cases have been, found by physicians who can only see such cases occasionally, we have made an effort to formulate practical rules for suspecting a patient of a thyrocardiac state, and our experience with this group of cases has led us to the following rules:

1. Every cardiac case in decompensation (or not in decompensation for that matter) with a goiter of whatever size or shape, and of however long standing without causing symptoms before the heart symptoms appeared, should be suspected of hyperthyroidism.

2. Every cardiac who has prominent or staring eyes should be suspected of hyperthyroidism.

3. Every case showing transient attacks of an established auricular fibrillation, where there is emaciation with pigmentation should particularly be suspected of hyperthyroidism.

4. Every case with auricular fibrillation, with or without decompensation, in which there is a discrepancy between the patient's condition, the history and the heart findings, should be suspected of hyperthyroidism.

For example, we do not commonly find young or middle aged people with auricular

fibrillation or with this and a persistent or variable decompensation not associated directly and varying with physical exertion unless there are present diastolic murmurs or other findings satisfactory to a diagnosis of a rheumatic heart disease. Most of the thyrocardiacs have no diastolic murmurs and no rheumatic history. It should be stated, however, that a number of our thyrocardiacs have also had rheumatic heart disease with mitral stenosis, and one had also aortic regurgitation to confuse the picture further.

Be it remembered that all but one of our thyrocardiacs had auricular fibrillation when they entered the clinic.

SURGICAL TREATMENTS

We have operated upon 38 such recognized and diagnosed cases of hyperthyroidism complicating heart failure to date.

The method of preparation for operation in brief has been as follows:

For those in extreme state when coming to us the emergency procedure has been:

1. Large and repeated doses of morphine;
2. Venesection;
3. Oxygen administration.

These and all others of the group have had:

1. Complete rest for at least 3 weeks (several have required long preparation); the degree of rest required differs from ordinary bed care in a ward to isolation with special nursing and every secondary aid to complete quiet.

2. They have had thorough digitalization, carefully maintained.

After this preparation when, in conference with the cardiologist it is determined that the greatest degree of relief from decompensation has been accomplished, the patient is operated upon. The endeavor has been to apply the operation which will accomplish the most at a single time without undue risk to the patient, by means of the divided stage procedure. In some instances when a patient has made good recovery from the decompensation it has even been possible to do a complete subtotal thyroidectomy in one stage. Fortunately, subtotal thyroidectomy upon the only moderately vascular thyroids found in this group is as a rule much easier than in those more toxic cases occurring in younger patients who have no complicating cardiac disorder and decompensation.

The operative procedure itself differs little in this group from that in the uncomplicated cases of hyperthyroidism, except that additional care must be exercised to make sure that the operative procedure chosen is one that will not require a prolonged anæsthesia, or produce an extreme degree of postoperative reaction.

In the beginning several of these cases were operated upon under local anæsthesia, with the idea that the heart would not endure gas oxygen anæsthesia. Of late, however, we have tended more to gas oxygen in these cardiac cases and cannot see but that it is endured quite as well as local anæsthesia.

We have been strikingly impressed with the ease with which most of these but partly compensated cardiac cases endure surgical procedure upon the thyroid. Fortunately, also there is no marked degree of postoperative reaction. They have required no unusual postoperative care, except digitalis for auricular fibrillation.

RESULTS

Thirty-eight of these cases coming to the clinic in differing stages of, and all with gross evidence of, cardiac decompensation, have now been operated upon with one death, a mortality rate in this group of 2.6 per cent of the cases operated on. The single operative death (December, 1922) came suddenly and unexpectedly 12 hours after a second stage operation. Death was not preceded by any aggravation of signs of toxicity or heart failure, and we believe it was due to an embolus of cardiac origin. No necropsy could be obtained.

For 3 years we have rejected no case as inoperable at the clinic though several have had such extreme congestion when they first entered the hospital that venesection in addition to other emergency treatment was required to save life. A few cases have come to the clinic in extreme heart failure and died without operation in a few hours or days in spite of emergency measures.

Ten patients were operated upon in one stage, 17 in two stages, 7 in three stages, and 4 in four stages.

Fourteen were absolutely bedridden for periods of weeks or months and in a few cases years before treatment. Twenty-one were unable to work and were in bed part of the time, and 3 (2 of these were among the very worst cases with gross heart failure) were still making an attempt to work until a few days before they came to us.

Six have been operated upon recently, are up and about, but have not yet been allowed by us to go to work. Twenty-seven are able to work steadily at the present time; one works part of the time (she has a rheumatic heart disease and had been bedridden 2 years before operation); and another one, a particularly uncontrollable woman of 50 years who had been in many hospitals always leaving against advice, we succeeded in preparing for operation in June, 1923. So far as can be told she had been in continuous heart failure for a year before this. She made the usual excellent recovery, lost her signs of failure completely, but against advice began at once to lead a very strenuous life. She did housework—had insufficient hours for sleep—and was continuously active until she failed again 3 months later. A stay of a few days in the hospital relieved her failure and she left against advice, resumed her activity until after failure set in. She arrived at another hospital just in time to die a few days ago (January, 1924). Two, who left the hospital in good condition, we have not been able to trace.

CONCLUSIONS

The effect of prolonged thyroid intoxication upon certain individuals is to produce auricular fibrillation, and eventually true heart failure. In these cases even partial restoration of compensation may quite safely be followed by thyroid surgery, in properly selected stages.

Subtotal thyroidectomy in such thyrocardiac cases relieves the failing heart of the burden that is making it fail and results in nearly all cases in complete relief of a complete disability. *There is no comparable condition where persistent heart failure is consistently and safely cured by surgical measures.*

This group of thyrocardiacs represents in a sense a new field for surgery, small but intensely fertile. It should stimulate everyone who has to deal with patients suffering with disability associated with heart failure, to consider carefully that an underlying hyperthyroidism is not overlooked.

The histories of our cases show the ease with which the ablest clinicians have been repeatedly deceived by these individual diagnostic problems, and have missed the crucial diagnosis of underlying hyperthyroidism. The certain inference is that there are scattered in the community occasional cases, undiagnosed thyrocardiacs, now disabled and discouragingly resistent to medical treatment directed at the heart, but potentially curable.

INTERSIGMOID HERNIA

With Report of a Case Involving Portions of Large and Small Intestine

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In reviewing the literature we have found nine other cases of intersigmoid hernia which is the rarest type of internal hernia. None of these cases shows a lesion of such extent as the one here reported, and on this account the present case is of more than ordinary interest.

The intersigmoid fossa or sigmoid notch is situated at the root of the mesosigmoid. Moynihan credits its formation to a failure in fusion of the left leaf of the mesosigmoid, with the parietal peritoneum below the kidney. This is Toldt's belief and one which is considered to explain best the formation of this opening.

The fossa is a cone-shaped funnel with apex upward and to the right and with orifice facing caudal and to the left. It lies directly over the pelvic brim and its posterior relationship brings it over the left ureter. The fossa is fairly constant and usually of a size to admit the ring finger as far as the second joint. Treves found a distinct fossa in 52 per cent and a funnel-shaped depression in 13 per cent of cases. Waldeyer found it in 84 per cent. One of us, in 46 cases examined, found the fossa in 80 per cent. It was of moderate size in 61 per cent. In these cases the length of the sigmoid varied from 22 centimeters to 62 centimeters and that of the mesosigmoid from 2 centimeters to 16 centimeters. Considering the variable length of sigmoid and mesosigmoid, the rarity of hernia through this fossa is surprising and must be due to the guarded position of the orifice.

In his monograph, Moynihan concedes as authentic 2 cases of intersigmoid hernia, namely those of Eve and Eccles. That of the latter has been questioned by later writers who consider it an inguinal hernia reduced *en masse*. The report of Lambret's case was inaccessible to Moynihan and was omitted from his summary. However, Coley includes this case as authentic, but questions Eccles' case. Moynihan accepts the latter and both are included in this paper.

In 1916 Rendle Short added to Moynihan's list the case reported by Coley, about which there can be no doubt. Krall had reported an instance in 1911, somewhat similar to that here presented in that a portion of the *sigmoid* itself was looped over and caught in the fossa. In the same year a case was reported by Machol. Another one published by Nuzum and Nuzum, we believe is authentic as also that reported by Taylor in 1918. We cannot, however, accept Black's case. There is also a case described by Murphy which must be included.

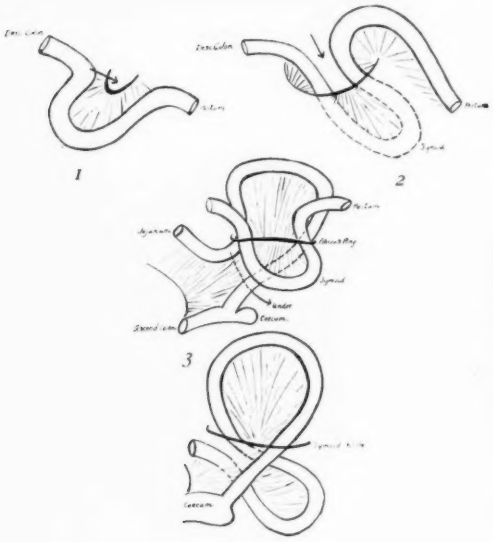
A short description of the salient features in the reports mentioned will establish the identity of the lesions described.

1. In Eccles' case a four-inch loop of small intestine had become strangulated passing under the margin of the intersigmoid fossa. The edge was divided and resection done, but death followed.

2. In Eve's case the sigmoid was drawn up by a band uniting it to the cæcum and the fossa thus was exposed. A left inguinal hernia had recently been reduced *en masse* and Coley believes that the obstruction may have been the sequel to this. Eccles definitely states: "The constricting edge afterward proved to be the margin of the aperture of intersigmoid fossa."

3. Lambret reports subacute obstruction for 3 days following straining at stool. At operation a loop of bowel was pulled out of the intersigmoid fossa, leaving a cavity the size of a mandarin, containing bloody exudate. The patient died after a further enterostomy.

4. The hernia reported by Coley was in a newborn male infant. The sac was very large and lay to outer side of the sigmoid flexure, the opening looking downward and to the right.



Figs. 1 to 4. Schematic drawings illustrating the development of the intersigmoid hernia.

5. Krall's case involving a portion of the sigmoid, has already been alluded to. In this instance, which was successfully operated on by Wilms, the upper rectum was twisted on its axis through 180 degrees and the lower sigmoid drawn up into the fossa.

6. Machol describes acute intestinal obstruction in a male of 66 wherein 30 centimeters of small bowel beginning 50 centimeters above the cæcum was found in the upper and largest of three recesses opening through the intersigmoid notch.

7. Nuzum and Nuzum give Le Count's description of the condition found at autopsy. There were no symptoms referable to the hernia. The illustration is descriptive. The fossa was 8 centimeters in diameter and the edge showed no thickening or enlarged blood vessels, and was covered by a glistening serous membrane. "The entire small bowel is in this sac."

8. Taylor reports a small knuckle of bowel ensnared by the fossa. The edge was nicked and the bowel freed; recovery followed.

9. In the instance cited by Murphy it was discovered that "a coil of the intestine had passed into a subperitoneal pocket at the root of the sigmoid and had become twisted on itself inside the pocket to the extent of producing strangulation." The patient recovered.

We therefore consider the case here recorded as the tenth of this rare condition.

The patient was a well-developed, well-nourished male 55 years of age. In September, 1921, a diagnosis of duodenal ulcer had been made by Dr. Cotton, and it was noted at that time that the sigmoid was mobile and reduplicated. In October, Dr. Cotton removed the appendix on account of recurring abdominal pain, and could find no ulcer; but the following February, the patient vomited half a pint of blood showing that the suspected ulcer was still active. During the summer he gained in weight and had no further pain.

On October 12, 1922, his bowels moved normally and the patient was apparently in good health. At 5:45 a.m., October 13, he was suddenly seized with pain in the lower abdomen and vomited. Dr. Cotton who was called, washed out the stomach and had an enema given which was effectual. An ounce of castor oil was then prescribed. At 9:15 the pain became more severe although the abdomen remained soft. The temperature was then 96 and the leucocyte count 24,000. At 10:30 a.m. he was in a state of shock. The extremities were cold, the pulse was rapid, the face drawn, and the abdomen somewhat rigid. In view of the former findings, the most probable diagnosis was that of perforated duodenal ulcer; but he was in no condition for exploration at this time. Accordingly five hundred cubic centimeters of 5 per cent glucose was given intravenously and heat and stimulants administered.

At the patient's request, following slight improvement in his condition, it was decided to explore at 4 p.m. after another five hundred cubic centimeters of glucose had been given.

On opening the abdomen a large quantity (probably 2 pints) of blood-stained fluid escaped and one could see strangulated bowel several feet in length, having a dull and purplish-black appearance. The patient was moribund, so no attempt was made to determine the extent of the lesion, or its exact cause.

Autopsy. The peritoneal cavity contained about 2 quarts of bloody fluid. A strangulated coil of small bowel about 60 inches in length presented. This was seen to emerge on the left and caudal side from a constricting band at the root of the sigmoid mesentery. On tracing the sigmoid upward from the rectum it was found that the upper or proximal 10 inches of the sigmoid itself went through this same hole in a direction opposite to that above described, forming a strangulated loop of sigmoid on the right or cephalic side. There was also on this side an eight-inch loop of ileum, distally continuous with the loop on the left side and proximally continuous with the jejunum. This last named loop

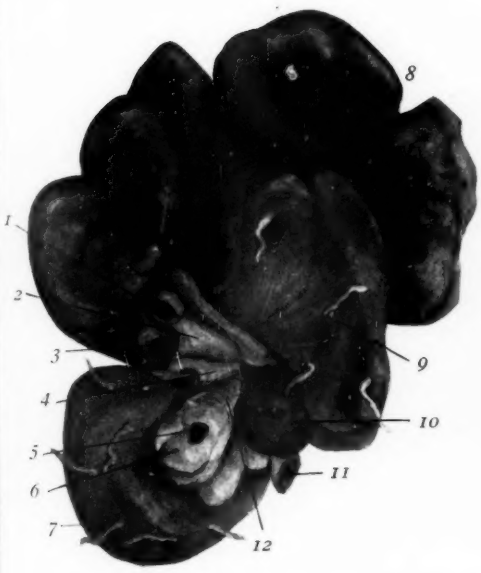


Fig. 5, a. Drawing of specimen removed *en masse*. *1*, Cut end of descending colon; *2*, cut sigmoid mesentery; *3*, cut end of jejunum; *4*, cut mesentery of jejunum and ileum; *5*, cut end of ascending colon; *6*, caecum; *7*, upper sigmoid; *8*, ileum, 60-inch loop; *9*, terminal sigmoid; *10*, jejunum; *11*, cut end of rectum; *12*, terminal ileum.

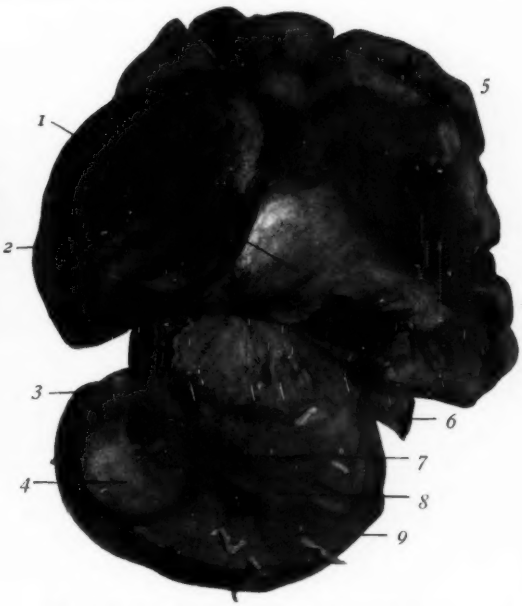


Fig. 5, b. Drawing of specimen removed *en masse* (another view of specimen shown in Fig. 5, a). *1*, Mesentery of ileum; *2*, intersigmoid fossa; *3*, cut end of ascending colon; *4*, cæcum; *5*, ileum, 60-inch loop; *6*, cut end of rectum; *7*, terminal sigmoid; *8*, jejunum, 8-inch loop; *9*, upper sigmoid.

was constricted by passing under the terminal ileum and mesentery, and not by the edge of the sigmoid fossa. The distal end of the sixty-inch loop on the left was constricted by the margin of the sigmoid fossa at a point one and a half inches from the ileocæcal valve.

There was no membrane noted. This may or may not have been present. In the event of the former, it had been destroyed either at operation or autopsy, for it was extremely difficult to trace the continuity of the various loops and their relationship to one another even with considerable rough handling. If no membranes were present, the funnel-shaped fossa had been converted into a ring, either by the hernia at the time of its occurrence, or some time previously by rupture of the cephalad right leaf of the sigmoid mesentery.

It is of interest to note that there was a chronic perforating duodenal ulcer one-third of an inch in diameter adherent to the head of the pancreas. It was found only on opening the duodenum and could not be felt through the wall of the gut.

The specimen (Fig. 5) was removed *en masse* by stripping the peritoneum and fascia from the pelvis, psoas muscles, and spine. Diagrams will serve to explain the condition and our view regarding its production. We have stated that no membrane was noted. The cephalic and caudal leaves of the sigmoid mesentery were continuous with one another through the fibrous ring. There was no torn peritoneal edge. We therefore consider it likely that the ring existed as such for a considerable time possibly as a developmental anomaly.

We believe that the sigmoid probably initiated the train of events by forcing its way through its fibrous ring at the root of its own mesentery (Figs. 1 and 2). The ileum then, excited to violent peristalsis, forced a loop beneath the distended sigmoid and through the ring in the opposite direction (Fig. 3). This continued until the terminal ileum was stretched taut by its fixation at the cæcum, and the ileum and its mesentery formed a band stretching across the pelvic brim. Beneath this the eight-inch loop of jejunum was

caught (Fig. 4). From the extent of the lesion one can readily understand the profound shock so rapidly occasioned by it.

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THE TREATMENT OF MALIGNANT DISEASES WITH RADIUM AND X-RAY—CANCER OF THE CERVIX[1]

By ROBERT B. GREENOUGH, M.D., F.A.C.S., BOSTON. CHAIRMAN

Report of the Committee on Treatment of Malignant Diseases with Radium and X-Ray, appointed by the American College of Surgeons

THE result of treatment of cancer of the cervix of the uterus was selected as the first subject for investigation. Abstract cards were prepared by the committee and the co-operation of the established clinics in the various cities represented was sought and obtained. To the many individuals who have taken part in the investigation, and especially to those junior men who took on the laborious task of transferring the clinic records to the abstract cards, the thanks of the committee are due. Without their interest and co-operation the investigation would have been impossible.

The cases selected for study were all treated in the years 1914 to 1919 inclusive. Each clinic was requested to provide a record of the cases of cancer of the cervix which entered the hospital within that period, whether treated by operation, by radium, or by any other method.[2]

It may be said that the results here recorded represent a considerable number of the clinics which are believed to be well equipped in every way to deal with this disease, either by radiotherapy or by radical operative measures.

The problem before the committee was to collect data in regard to cases of cancer of the cervix treated by operation, by radium or X-ray, or by any other method, or com-

[1] The accompanying report is that of a committee appointed in February, 1922, and includes the data collected up to February 1, 1924. The membership of the committee is as follows: C. F. Burnam, Baltimore; G. W. Crile, Cleveland; William Duane, Boston; J. M. T. Finney, Baltimore; Burton J. Lee, New York; H. K. Pancoast, Philadelphia; H. Gideon Wells, Chicago; Francis C. Wood, New York; R. B. Greenough, chairman, Boston.

The chairmen of the local committees are: J. M. T. Finney, Baltimore; R. B. Greenough, Boston; Harvey R. Gaylord, Buffalo; Albert J. Ochsner, Chicago; George W. Crile, Cleveland; C. Jeff Miller, New Orleans; Charles H. Peck, New York; John G. Clark, Philadelphia; Charles H. Mayo, Rochester; Alexander Primrose, Toronto.

[2] The committee has collected 1,210 case records for analysis. These records come from the following hospitals:

1. Free Hospital for Women, Boston, Dr. W. P. Graves
2. Huntington Hospital, Boston, Dr. G. A. Leland
3. Massachusetts General Hospital, Boston, Dr. Lincoln Davis
4. Augustana Hospital, Chicago, Dr. Henry Schmitz
5. Cook County Hospital, Chicago, Dr. Henry Schmitz
6. German-American Hospital, Chicago, Dr. Henry Schmitz
7. Post-Graduate Hospital, Chicago, Dr. Henry Schmitz
8. St. Mary's Hospital, Chicago, Dr. Henry Schmitz
9. St. Joseph's Hospital, Chicago, Dr. Henry Schmitz
10. Washington Boulevard Hospital, Chicago, Dr. Henry Schmitz
11. Frances Willard Hospital, Chicago, Dr. Henry Schmitz
12. Roosevelt Hospital, New York, Dr. Howard C. Taylor
13. University Hospital, Philadelphia, Dr. John G. Clark
14. Philadelphia General Hospital, Philadelphia, Dr. Charles P. Norris
15. Scranton Hospital, Scranton, Pa., Dr. J. M. Wainwright
16. Presbyterian Hospital, New York, Dr. James A. Corscaden
17. Toronto General Hospital, Toronto, Dr. Alexander Primrose
18. Howard A. Kelly Hospital, Baltimore, Dr. Curtis F. Burnam
19. Jefferson Hospital, Philadelphia, Dr. B. A. Anspach
20. Woman's Hospital, New York, Dr. George Gray Ward
21. Memorial Hospital, New York, Dr. Wm. P. Healey
22. Lakeside Hospital, Cleveland, Dr. George W. Crile

bination of methods. In order to make possible a fair comparison of the results of treatment, it was necessary that the same rigid conditions should obtain in determining the results of all methods of treatment as have been agreed upon by the surgical world to be necessary in reporting the end-results of the operative treatment of cancer in its various situations. It was also necessary, especially when dealing with the cases treated by radiation, to obtain a classification of cases according to the extent of disease present at admission to the hospital, so that early favorable cases treated by operation should not be compared directly with advanced cases subjected to radiation only as a palliative measure. Such a classification of cases, based upon the clinical findings on admission and corrected when possible by subsequent operative findings, has been procured.

The correction of the clinical classification of cases by subsequent operative findings undoubtedly leads to a more correct estimate of the actual conditions, but it should be recognized that cases which are not subjected to operation are not reclassified, and this fact therefore works somewhat to the disadvantage of the cases treated by radium or other non-operative procedures.

Before presenting the statistical result of the investigation, a few comments upon the conditions seem to the committee to be appropriate. In order to obtain a sufficient number of case records, and in order to have a sufficiently long period after operative treatment to estimate the end-results on the arbitrary 3-year basis, it was necessary to set the period of investigation for the calendar years 1914–15–16–17 and 18. In 1923 this was extended to include the year 1919.

During this period, which includes the years of the war, hospital services were somewhat disorganized, clinical work on these problems was interrupted, and hospital records were not always kept as fully up to date as could be desired. The radical operative treatment of cancer of the cervix had been fairly well standardized, and was in general use in operative clinics. Radium therapy, during these years, however, was in a state of constant experimental modification. The dosage employed was as a rule less than in these same clinics at the present time, 1924, and the application of radium was less accurately accomplished. Repeated treatments were employed in many cases in contrast to the single, massive dose administered under anæsthesia and with all the conditions of a surgical operation, such as is the usual technique at the present time. It may be said that it is the general opinion of radiotherapists that the results of radium therapy during the period under discussion were far less favorable than are those to be anticipated from the technique now employed. Since the results of the present method, however, cannot be judged for at least 3 years to come, it is believed wise to consider what was then accomplished and to await the end-results of the present methods as they mature. We must admit, however, that as between radium and radical operation, these conditions are to the disadvantage of radium in no small degree.

During the period concerned in this investigation, high voltage, short wave length X-ray therapy was not in common use, and no cases were recorded in which X-ray was employed except as an adjunct to other methods. To judge of the value of X-ray from these data is therefore quite impossible.

The standard surgical report of end-results in cancer cases furthermore demands pathological evidence of the presence of cancer. In operative cases this is readily obtained, as the tissue removed is submitted entire to the pathologist. In many cases suitable for radiotherapy, however, the removal of tissue for a biopsy cannot be accomplished without adding to the discomfort of the patient, or prolonging the operation, and for these reasons is occasionally omitted by the surgeon who feels himself quite competent to make a diagnosis on clinical evidence alone. Such cases, while in all probability actual cases of cancer, are of no value in this investigation, as they fail to fulfill the prescribed conditions, and thus must be omitted as inconclusive. There were 32 such cases in this series; 8 in which hysterectomy was followed by radium and 22 in which radium alone, or combined with cauterization, was employed. All of these cases are alive and well and their omission on

account of lack of pathological evidence of cancer lowers the percentage of "cures" by radium in comparison with hysterectomy. We believe that due weight should be given to these facts in estimating the value of the different methods of treatment.

Attention should be called to the use of the word "cure" in the following pages. The term is used as the most convenient one to express the fact that the case in question is reported free from evidence of disease at a period 3 years or more subsequent to treatment. It is not meant to imply that subsequent recurrence of the disease may not take place. It is the purpose of the Committee to obtain later reports on all these cases.

While the total number of case records is already large, constant additions to this number are to be expected, and supplementary reports will be prepared from time to time and presented by the committee. When the total number of cases is divided into the different classes, however, and when these numbers are again subdivided into smaller groups, according to the method of treatment employed, the numbers of cases in each group are much diminished, to such an extent, indeed, in certain groups as to make possible serious error, if too much weight is placed upon variations of slight degree in the percentages obtained.[1] The committee does not wish to be accused of failing to recognize these facts, but draws attention to them that no misunderstanding of the conditions may occur. Such as they are, however, and pending the receipt of additional records which may tend to overcome this objection by providing larger numbers of cases in each group, the results are here reported.

[1] By the courtesy of Professor E. B. Wilson of the Harvard School of Public Health the following explanatory footnote has been added to this report.

The mathematical formula commonly used by statisticians to indicate the influence of chance in determining percentage relations is expressed as "standard deviation." This term is meant to indicate that chance fluctuations would be expected to lie, at least two-thirds of the time, within the assigned limits.

The formula is as follows: Let N represent the number of cases recorded and F the fraction "cured." The "standard deviation" would be $\sqrt{F\,(1-F)} \div N$. Taking the figures from Table III, as applied to Class 1.A; N=123; F=35/123 or .28. The "standard deviation" would then be $\sqrt{.28 \times .72} \div 123$. This is .04+.

In terms of percentage this indicates that at least two-thirds of the time the chance fluctuations of the 28 per cent recorded in Table III would lie between 24 per cent and 32 per cent.

The "standard deviation" has been calculated in this way for the percentages given in these tables and is noted in the text in reference to those tables where it is a matter of significance.

Another formula, "probable error," is sometimes used by statisticians. "Probable error" is two-thirds of "standard deviation" and indicates that one-half of the time the fluctuations due to chance would lie within the assigned figures.

"Standard deviation" has been used in this paper in preference to "probable error" as being the more rigorous test.

TABULATION OF RESULTS

It was necessary to reject 381 records of the total number of 1,210. The reasons for discarding these records are stated in the Table I.

Thirty-two cases were rejected as they lacked pathological evidence of the presence of cancer; these cases were, however, all alive and well more than 3 years after treatment.

Twenty-five cases were rejected because less than 3 years had elapsed from the time of the last treatment; these cases also were alive and well.

Five cases, however, were accepted as three year "cures" in which a period of 3 years had not elaspsed after the last treatment with radium. These were all cases in which the original treatment was given more than 3 years before, and the later radium treatment was given, without evidence of recurrence, only as a prophylactic measure. One of these was a case of hysterectomy with postoperative prophylactic radiation, one, cautery and radium, and three were treated by radium alone.

Eight hundred and twenty-nine cases remain as satisfactory for study.

TABLE I.—REASONS FOR REJECTING 381 RECORDS

Total cards received		1,210
Discards:		
Untraced	159	
Not cancer of cervix	10	
No treatment	56	
No pathological diagnosis	32	
Under 3 years	25	
Re-entries—duplicates	23	
1913 and 1920–1921–1922	43	
No data to classify	13	
Otherwise inconclusive	20	
		381
Satisfactory for study		829

In Table II we have divided the 688 primary cases into the four groups:

1.A—Early favorable
1.B—Border-line
1.C—Broad ligaments involved
1.D—Advanced cases

There were 123 cases of recurrence after hysterectomy; the hysterectomy in these cases having been done in some other institution. None of these cases appears in the 688 primary cases above recorded.

There were 18 cases in which cancer of the cervix developed in the stump left after a supravaginal hysterectomy for fibroid.

TABLE II.—DIVISION OF PRIMARY CASES

Primary cases:	
1.A—Early favorable	123
1.B—Border-line	120
1.C—Broad ligaments involved	310
1.D—Advanced cases	135
	688
Recurrent after hysterectomy	123
Cancer of cervical stump	18
Total	829

Table III records the results of treatment in the different classes of cases. As would be expected the greatest number, as well as the greatest percentage of "cures," occur in the early and favorable cases.

There were 9 "cures" of recurrence after hysterectomy and there were 2 "cures" in cancer of the cervical stump. Ninety-four cases of the whole number, or 11 per cent, were "cured" of their disease. It should be repeated that in all of these tables the word "cure" is used advisedly to indicate only a period of 3 or more years elasped without evidence of disease. It is the intention of the committee to obtain later reports on all these cases.

TABLE III.—RESULTS OF TREATMENT IN DIFFERENT CLASSES OF CASES

Primary cases:	Cases	"Cures"	Per cent
Class 1.—A	123	35	28
Class 1.—B	120	22	18
Class 1.—C	310	24	7
Class 1—D	135	2	1
	688	83	8
Classes 2 and 3—Recurrent after hysterectomy	123	9	7
Class 4—Cervical stump	18	2	11
Totals	829	94	11

All of the cases of this series entered the hospital in the calendar years 1914–1919 inclusive.

Table IV indicates the number of years that have elapsed in the "cured" primary cases. It is to be noted that cures of 6 or 7 years' duration have been obtained by hysterectomy with or without radium, and by radium, or radium with palliative operation.

TABLE IV.—NUMBER OF YEARS ELAPSED IN "CURED" PRIMARY CASES

"Cures"	Duration Yrs. 3–4	Yrs. 4–5	Yrs. 5–6	Yrs. 6–7	Yrs. 7–8	Total
Hysterectomy alone	5	5	6	3	..	19
Hysterectomy and radium	1	1	..	4	2	8
Radium and hysterectomy	2	3	1	1	3	10
Radium alone	12	5	1	2	4	24
Radium and X-ray	1	1	1	1	..	4
Radium and cautery	2	6	5	..	3	16
Radium and amputation	..	1	..	..	..	1
Cautery and ligation	..	1	..	..	..	1
Total	23	23	14	11	12	83

Table V indicates the actual numbers of cases, and the percentage of the total number, which were "cured" by different methods of treatment. It will be seen that radium alone or with X-ray, was responsible for 37 "cures" or 4.4 per cent of the total number; and radium and X-ray, with or without a palliative operation, gave 56 "cures" or 6.6 per cent of the total cases treated. This is to be taken merely as an indication of the absolute value of radium in the treatment of this series of cases of cancer of the cervix. It is not in any way an indication of the relative value of radium as compared to hysterectomy.

TABLE V.—ACTUAL NUMBER OF CASES AND PERCENTAGE OF TOTAL NUMBER "CURED" BY DIFFERENT METHODS OF TREATMENT

829 Cases—94 "Cures"

	"Cures"	cent
By hysterectomy alone	19	2.2
By hysterectomy supplemented by radium	18	2.1
By radium alone or with X-ray	37	4.4
By radium and palliative operation	19	2.2
By cautery alone	0	...
By cautery and ligation of internal iliacs	1	0.1
Total	94	11

Table VI shows the results of different methods of treatment in 688 primary cases regardless of the extent of their disease. It is to be noted that the percentage of "cures" by hysterectomy alone (26 per cent) is the same as the "cures" in cases where pre-

operative or postoperative radium is employed. The operative mortality of 16 per cent following hysterectomy is also to be noted.

There were 146 hysterectomies performed in the 688 primary cases. One hundred and twenty-seven were pan-hysterectomies after the Wertheim technique. Nine were recorded merely as abdominal hysterectomies. In 6 cases only a supravaginal hysterectomy was done, and in 4 cases vaginal hysterectomy was performed. It is a notable fact that 3 of the 4 vaginal hysterectomies resulted in cure.

Fifty-two cases were treated by cautery alone, and in 92 cases cautery was used in combination with radium or X-ray. In many of the hysterectomies also cautery was used as a preliminary measure, either prior to, or as a first step in, the radical operation. In 24 of the cautery operations the record stated that the Percy technique was followed. Five of these cases appear in the list of cures, but in 4 of them the cauterization was supplemented by radium treatment, and in the other one a hysterectomy was done. No one of the 52 cases in which cautery alone was used resulted in cure.

TABLE VI.—RESULTS OF TREATMENT REGARDLESS OF EXTENT OF DISEASE

	Cases	"Cures"	Per cent
Hysterectomy alone	74	19	26
Hysterectomy with radium	70	18	26
Hysterectomy with X-ray	2	0	..
146 hysterectomies	...	..	..
23 operative fatalities	...	..	16
Hysterectomy with pre-operative radium	40	10	25
Hysterectomy with postoperative radium	30	8	27
Hysterectomy with or without radium	146	37	25
40 hysterectomies with pre-operative radium	...	..	..
4 operative fatalities	...	..	10

Table VII gives some further details of the results of treatment. It is to be noted that the pre-operative use of radium in 40 cases, followed by hysterectomy, gave approximately the same percentage of "cures" (25 per cent) as when radium was used in post-operative treatment (27 per cent). It is to be noted also that the 40 cases of pre-operative radiation did not appear to increase the hazard of operation to any great extent as it was found that only 4 (10 per cent) of these cases died of operation.

TABLE VII.—FURTHER DETAILS OF TREATMENT

	Cases	"Cures"	Per cent
Radium alone	363	24	6
Radium and X-ray	20	4	20
Radium and cautery	91	16	17
Radium with or without X-ray or palliative operation	478	45	9
Cautery alone	52	..	....
Other methods	12	1	8
478 radium applications	...	..	....
1 operative fatality	...	..	0.2

The main purpose of this investigation may be said to have been to obtain a classification of cases with reference to the extent of the disease in order that a fair comparison should be possible of the results of different methods of treatment in similar cases.

Table VIII indicates the results of treatment in the 1.A group of early favorable (operable) cases.

Hysterectomy without radium gave 14 "cures" in 41 cases (34 per cent). There were 8 operative fatalites, a mortality of 19 per cent, and the use of radium either before or after operation did not appear to increase the percentage of "cures."

Radium alone gave 15 per cent, and radium combined with X-ray, cautery or other minor operative procedure, gave 6 "cures" or 42 per cent.

The numbers, however, are small and it is probable that we get a more accurate idea of the prospect of cure if we combine the cases treated with radium, either with or without the use of the cautery, getting 11 "cures" in 44 cases, or 25 per cent. Roughly stated, in early favorable cases, hysterectomy gives 1 chance in 3 of cure, with an operative mortality of 1 in 5, where radium, with or without the cautery, gives a chance of cure of 1 in 4 without mortality.

If to these percentages we apply the statisticians' correction for "standard deviation" we find that the 34 per cent "cures" by hysterectomy should be recorded as ± 7.4 and the 25 per cent for radium (with or with-

out cautery or X-ray) should be ± 6.5. Thus chance alone might bring about a variation for the hysterectomy percentage from 26.6 per cent to 41.4 per cent and for the radium cases from 18.5 per cent to 31.5 per cent. It is readily seen that these bounds actually overlap and the difference in percentage is not of serious statistical significance.

TABLE VIII.—RESULTS OF TREATMENT IN GROUP I.A

I.A—123 Cases	Cases	"Cures"	Per cent
Hysterectomy without radium	41	14	34
8 operative fatalities	..	..	19
Hysterectomy with radium	28	9	32
Pre-operative radium	13	4	30
3 operative fatalities	..	..	23
Postoperative radium	15	5	33
No fatalities	..	..	..
Hysterectomy with or without radium	69	23	33
Radium alone	30	5	16
Radium and palliative operation and X-ray	14	6	42
Radium with or without palliative operation and X-ray	44	11	25

The I.B group represents the so-called border-line cases, those in which the disease has begun to involve the vaginal wall or the cavity of the uterus, but without extension into the broad ligaments (Table IX).

Hysterectomy alone gave 25 per cent "cures" in 16 cases. The operative mortality ran as high as 31 per cent. Hysterectomy with radium gave 33 per cent "cures" in 15 cases. The cases in which radium was used before operation, while only 6 in number, gave 3 "cures," or 50 per cent.

Radium alone gave only 10 per cent of cures. Radium with palliative operation gave a showing equal to that of the hysterectomies with or without radium, and radium with or without a palliative operation, gave 13 "cures," or 16 per cent.

It would appear that in the border-line cases the prospect of cure by hysterectomy is less; the use of radium before operation may possibly improve the outlook, and the operative mortality is higher than in the I.A group.

Although the numbers are small, it would suggest that the use of radium supplemented by a palliative operation, gave the greatest prospect of cure and without operative risk. The calculation of the "standard deviation," however, indicates that the difference of percentage is not of great significance, viz., hysterectomy with or without radium, 29 per cent ± 8; radium with palliative operation, 33 per cent ± 3.

TABLE IX.—RESULTS OF TREATMENT IN GROUP I.B

I.B—120 Cases	Cases	"Cures"	Per cent
Hysterectomy without radium	16	4	25
6 operative fatalities	..	..	37
Hysterectomy with radium	15	5	33
Pre-operative radium	6	3	50
1 operative fatality	..	..	16
Postoperative radium	9	2	22
No fatalities	..	..	..
Hysterectomy with or without radium	31	9	29
Radium alone	56	6	10
Radium with palliative operation	21	7	33
Radium with or without palliative operation	77	13	16

Table X combines the groups I.A and I.B giving larger numbers to deal with. Roughly stated, hysterectomy without radium cures 1 in 3 with an operative fatality of 1 in 4.

Radium with a palliative operation cured about 1 in 3, and radium with or without palliative operation about 1 in 5.

If we calculate the "standard deviation" in these percentages we get:

Hysterectomy, with or without radium, 32 per cent ±4.6
Radium, with or without palliative operation ..... 19 per cent ±3.5

TABLE X.—RESULTS OF TREATMENT IN GROUPS I.A AND I.B COMBINED

I.A and I.B (combined)	Cases	"Cures"	Per cent
Hysterectomy without radium	57	18	31
14 operative fatalities	...	..	21
Hysterectomy with radium	43	14	32
Pre-operative radium	19	7	36
4 operative fatalities	...	..	21
Postoperative radium	24	7	29
No fatalities	...	..	..
Hysterectomy with or without radium	100	32	32
Radium alone	86	11	12
Radium with palliative operation or X-ray	35	13	37
Radium with or without palliative operation	121	24	19

Table XI gives the results of treatment in the I.C group where the disease was believed to have infiltrated the broad ligaments.

There was 1 "cure" (7 per cent) and 2 operative fatalities in 13 cases treated by

hysterectomy alone. The addition of preoperative or postoperative radiation increased somewhat the percentage of "cures" (16 per cent); the numbers, however, were rather small.

Radium alone cured 12 cases, and radium with palliative operation 7 cases; the numbers treated, however, were large and the percentage small.

TABLE XI.—RESULTS OF TREATMENT IN GROUP I.C

I.C—311 Cases	Cases	"Cures"	Per cent
Hysterectomy without radium	13	1	7
2 operative fatalities	...	..	15
Hysterectomy with radium	25	4	16
Pre-operative radium	19	3	16
No fatalities	...	..	..
Postoperative radium	6	1	16
No fatalities	...	..	..
Hysterectomy with or without radium	37	5	13
Radium alone	189	12	6
Fatalities	1	..	½
Radium and palliative operation or X-ray	52	7	13
Radium with or without palliative operation	241	19	7

Table XII shows the advanced and supposedly hopeless cases. Six cases were operated upon, with or without radium, without success. Only 2 cases appear in the three year "cures," 1 treated by radium alone, and 1 by radium and cauterization. It is obvious that these two cases at least were erroneously classed as "hopeless." This is in all probability due to the difficulty in distinguishing fixation of the uterus due to cancerous infiltration of the broad ligaments from a similar infiltration of an inflammatory character.

TABLE XII.—RESULTS OF TREATMENT IN GROUP I.D

I.D—135 Cases	Cases	"Cures"	Per cent
Hysterectomy without radium	4	0	0
Hysterectomy with radium	2	0	0
Hysterectomy with or without radium	6	0	0
Radium alone	88	1	1.1
Radium with palliative operation	27	1	3
Radium with or without palliative operation	115	2	1.7

Table XIII shows the duration of life in the cases not cured. It will be seen that no material difference exists as between the different methods of treatment.

In the early favorable group radium alone gave a slightly longer average of life, but in the less favorable cases this is not so apparent.

Four cases in the I.B group treated by hysterectomy averaged 27 months. These numbers, however, are so small that little reliance should be placed upon this isolated observation.

TABLE XIII.—DURATION OF LIFE IN CASES NOT "CURED"

Hysterectomy alone	Cases	Months
Class I.A	18	21
Class I.B	4	27
Class I.C	9	13
Class I.D	...	..
Radium alone		
Class I.A	25	28
Class I.B	47	14
Class I.C	167	14
Class I.D	78	9
Radium, cautery, X-ray		
Class I.A	...	..
Class I.B	12	9
Class I.C	40	13
Class I.D	22	9

Rectovaginal and vesicovaginal fistulæ occur spontaneously in cases of cancer of the cervix. There were 8 such cases in the entire series of primary cases (Table XIV).

The danger of fistula formation is apparently increased by any method of treatment, thus hysterectomy alone gave 5.5 per cent; cautery alone 5.6 per cent; radium alone 5.7 per cent; and cautery and radium 7 per cent.

It would appear that the danger of fistula formation should not weigh heavily in the choice of methods of treatment.

TABLE XIV.—RECTOVAGINAL AND VESICOVAGINAL FISTULÆ

	Cases	Fistulæ	Per cent
Spontaneous	688	8	1.1
After hysterectomy alone	74	4	5.5
After cautery alone	52	3	5.6
After radium alone	363	21	5.7
After hysterectomy and radium	70	4	5.6
After cautery and radium	91	7	7.0
Other methods	38	0	...
		47	

The value of radium as a palliative measure in the treatment of incurable cases is generally admitted (Table XV). That life is materially prolonged by the use of radium is hard to prove.

Local healing of the disease in the cervix or vagina was noted, however, in 75 cases which failed of cure. This, of course, means relief from the offensive discharge and hæmorrhages which are characteristic of the advanced stages of the disease.

Table XV indicates the methods of treatment which resulted in local cure. The small group of cases in which radium and X-ray was used is perhaps most striking. Of 20 cases, 4 were "cured" of their disease and 6 obtained local healing. Thus in 50 per cent of this small group the local lesion was destroyed.

TABLE XV.—LOCAL RESULTS OF TREATMENT

	Cases	"Cures"	Local Healing
Hysterectomy alone	74	19	3
Hysterectomy and X-ray	2	0	1
Hysterectomy and radium	70	18	13
Radium alone	363	24	37
Radium and X-ray	20	4	6
Radium and palliative operation	95	17	14
Cautery alone	52	0	1
Other methods	12	1	0

Table XVI shows that the cases which showed recurrence after hysterectomy gave 7 "cures" by radium alone, and 2 "cures" by radium and cautery. Of 18 cases in which cancer of the cervix developed after a previous hysterectomy for fibroid only 2 were "cured" and those by radium alone.

TABLE XVI.—RESULTS OF TREATMENT IN RECURRENCE AFTER HYSTERECTOMY

	Cases	"Cures"	Per cent
Recurrent after hysterectomy	123	9	7
By radium alone	...	7	..
By radium and cautery	...	2	..
Cancer of cervical stump	18	2	11
By radium alone	...	2	..

An estimate of radium dosage in millicurie or milligram hours alone is misleading. The amount of filtration and the distance must also be considered. It is an interesting fact, however, that the average amount of local or contact radiation employed in the successful cases was 5,004 millicurie hours, irrespective of deep γ-radiation or X-ray applied externally (Table XVII). Such an amount of radiation can be obtained only by very prolonged treatments (4 to 8 days) when radium tubes of only 25 or 50 milligrams are used. The smallest dosage of radium used in the "cured" cases was as follows:

	Millicurie hours
Class A	1,700
Class B	1,725
Class C	2,200

The largest dosage in a "cured" case was 16,000 millicurie hours given in twenty-nine treatments.

In general, during this period there has been a distinct tendency to abandon the many times repeated small dosage local treatment, in favor of the single massive dose of radiation administered under an anæsthetic and with all the conditions of a surgical operation. In certain well equipped clinics this is further supplemented by heavy γ-radiation or X-ray.[1]

TABLE XVII.—RADIUM DOSAGE (LOCAL)

	Average Millicurie Hours
57 "cured" primary cases	5,004
1.A Class—16 cases	3,354
1.B Class—18 cases	5,896
1.C Class—23 cases	5,455

Table XVIII shows the different varieties of cancer in 83 "cured" cases. It is apparent that no uniform method of classification has obtained wide acceptance in the clinics here represented. It is of interest, however, to note that the milder forms of the disease—adenocarcinoma and papillary carcinoma—are not by any means the only ones to be cured, whatever agency is employed.

It is also of interest to note that of all the cases in which hysterectomy resulted in a "cure," in only 2 was evidence presented that the disease had extended beyond the uterus itself, and in these two cases the pelvic lymph nodes were not diseased but cancer was found by microscopical examination, in the parametrial tissue adjacent to the cervix.

[1] At the suggestion of one of the members of the Committee the following statement is made to supplement the report:

Much variation is found in the technique employed in radium therapy in this series of cases; methods were constantly changing in the period covered; and it is probable that during this time methods have been materially improved. It is the purpose of the Committee to submit a later report dealing with the details of treatment with radium, but it must be remembered that nothing short of the very best of radium treatment, as well as the best of surgical skill, should be considered adequate in dealing with this disease.

TABLE XVIII.—VARIETIES OF CANCER IN 83 "CURED" CASES

	"Cures"
Adenocarcinoma	8
Adeno-acanthoma	1
Carcinoma	14
Epidermoid carcinoma	5
Squamous cell carcinoma	42
Solid carcinoma	1
Cylindrical cell carcinoma	1
Epithelioma	7
Papillary carcinoma	4
Total	83

SUMMARY

1. As a result of the study of the case records submitted to the committee certain conclusions may be drawn. We would again emphasize the fact that this is to be regarded only as a preliminary report, and that it is the purpose of the committee to collect further data and extend the time beyond the minimum period of 3 years, so that knowledge of the more remote end-results of these cases may be obtained. The figures available to the committee are submitted and such conclusions drawn as seem justified by the results.

2. Of 829 cases of cancer of the cervix 94 were free from disease 3 or more years after treatment. More than half of these "cures" were obtained by the use of radium and X-ray without radical operation. There were no "cures" by cautery alone.

3. In 243 cases of the 1.A and 1.B group (early favorable and border-line cases) hysterectomy alone cured 1 in 3, with an operative mortality of 1 in 5. Radium with palliative operation (cautery) cured about 1 in 3, and radium alone (or with palliative operation) about 1 in 5. Under these conditions it may be said that the choice between operation and radium in the treatment of early and favorable cases of cancer of the cervix is an open one. It is to be borne in mind that the results of treatment by radium used with the technique of the present day, are not yet available but that it is generally believed that they will be better than the figures here presented.

4. In more advanced cases (1.C and 1.D) the "cures," either by radiation or by hysterectomy, were very few.

5. The duration of life in the unsuccessful early cases is somewhat greater after radium than with operation.

6. The formation of rectovaginal and vesicovaginal fistulæ occurred with nearly equal frequency with all methods of treatment.

7. Radium, with or without X-ray or palliative operation, was the most important agency in the destruction of local disease in cases which failed to obtain a "cure." The value of radium as a palliative measure in advanced cases is beyond dispute.

8. In the treatment of recurrent cases after hysterectomy, and in cancer of the cervical stump, radium is to be preferred to other methods.

9. A sufficiently large dosage of radium is necessary to obtain destruction of the local lesion. The treatment of cancer of the cervix with inadequate amounts of radium should not be encouraged.

10. A uniform classification of the pathological varieties of cancer of the cervix is much to be desired.

AIR EMBOLISM IN OBSTETRICS[1]

By JAMES A. GOUGH, M.D., Chicago

FOR many years air embolism has been a subject of controversy among obstetricians; the literature of a few decades ago abounds in instances cited as examples of air embolism. With the development of bacteriology and the isolation of gas-producing organisms, fewer cases have been reported, and the finding of gas in the heart and blood vessels at postmortem is no longer considered conclusive evidence of death from this cause. That air, if admitted in large quantities into the veins of animals, would produce death was recognized in the seventeenth century; and it is recorded that Rédi in 1667 killed horses and oxen by this means. His method was crude, consisting in inserting a cannula into the external jugular vein of the animal and then blowing several forceful expirations into the vein, death resulting very promptly.

The first case reported in surgery is that of Beauchene (2) in 1818. During an operation for the removal of a tumor from the neck, a large vein was severed. A peculiar hissing sound was heard, and almost at the same instant the patient collapsed and died a few minutes later. At the postmortem examination made within a few hours, the right heart was found distended with air, and death was attributed to this cause. Because of the repeated occurrence of this accident in operations on the neck during the last century, this region was the first to be considered one of the "danger zones" in the etiology of air embolism. Further reference to the occurrence of this accident in general surgery, I have purposely omitted from this article.

EXPERIMENTS

Since the crude experimental work of Rédi, many investigators have studied air embolism; Virchow (30), Senn (28), Hare (13), L. von Lesser (21), Perkins (26), McClintock (23), and Malcolm Goodridge (12) are among the best known names in this connection. This work has, in general, been directed toward the solution of three problems: (1) the quantity of air necessary to produce serious or fatal symptoms, (2) the mechanism of death, and (3) rational methods of combating the condition once it has occurred.

1. *Fatal dose.* The quantity of air required has been found to vary greatly in the hands of different experimenters, no two having obtained quite the same results. Blair and McGuigan (3), following an extensive study of the subject, have summarized these variations very aptly in their statement: "The fatal dose varies enormously with the same and different species." It is impossible to predict with any accuracy the quantity of air required to produce serious symptoms in a given case.

2. *Mechanism.* Small quantities of air on entering a vein are carried by the blood stream through the heart into the pulmonary circulation and escape through the pulmonary alveoli; no symptoms are produced. Larger quantities on entering the right heart interfere with the closure of the auriculoventricular valve, and the compressibility of a gas, as distinguished from that of a liquid, prevents its being carried on into the pulmonary artery. As a result, the air is churned back and forth in the right heart, and if the quantity is sufficiently large, death ensues promptly as a result of the interference with the pulmonary circulation and consequent lack of oxygen supplied to the vital centers. A somewhat smaller quantity of air will permit sufficient blood to be pumped through the pulmonary circulation to maintain life for a time; the heart, endeavoring to fulfill its function, increases its rate to compensate for the diminished output with each systole. Eventually, however, the myocardium is weakened, and death results from the same cause as when a more massive dose is given, although this may be minutes or hours later. The only essential finding at postmortem is the dilated right heart filled with air.

3. *Treatment.* The treatment of air embolism, apart from purely supportive mea-

[1]Read before the Chicago Gynecological Society, January, 1924. (For discussion, see p. 122.)

sures, has been directed toward the removal of the air from the heart. Amussat (1) was the first to advise this procedure. Nicholas Senn, by aspirating the right ventricle, was able to save three out of seven dogs on which he tried the procedure. Goodridge followed aspiration by an infusion of normal saline into the vein, thus saving nine of eleven dogs. Blair and McGuigan obtained the best results by injecting 40 to 50 cubic centimeters of normal saline containing 2 cubic centimeters of 1:10,000 to 1:1,000 adrenalin chloride directly into the right ventricle. Any of these measures, to be effectual, must be applied within a very few minutes of the onset of symptoms. Delore and Duteil (9) aspirated the right heart of a man suffering from air embolism but were too late in their attempt.

IN OBSTETRICS

The significance of air embolism in obstetrics was first recognized by Legallois(19) in 1829, who suggested that the entrance of air into the uterine veins might be a source of danger in recently delivered women. But it was not until 1850 that Cormack(6), an English physician, reported three cases as having occurred in his locality. The following year George May (22), also in England, reported three more cases. Since that time, many cases have been reported, and from this number, I have chosen only the most authentic and typical.

MEDICOLEGAL ASPECT

Swinburne (29), in 1859, was the first to recognize the medicolegal aspect of this subject, and reported a death from air embolism following an attempt at criminal abortion. Many similar cases have since been reported, among which I may mention those of Draper (10), Braun(4), Perkins(26), and Hektoen(14). The latter's report illustrates clearly the mechanism of this occurrence: A nineteen year old woman about 4 months pregnant, while taking a douche, using a syringe filled with cold water, collapsed and died in a few minutes. The postmortem examination by Dr. Hektoen revealed a large amount of air in the right heart. The placenta was partially separated, and many patulous sinuses were seen in the uterine wall beneath the detached portion, some large enough to admit a pencil. In the case cited by Perkins, the placenta was attached relatively low, and when the abortionist's instrument was introduced, air was injected directly into the placental site.

IN PLACENTA PRÆVIA

Among legitimate obstetrical operations, none has been attended so frequently by air embolism as procedures undertaken for the purpose of saving the mother's life in placenta prævia. Kramer(17), Heuck(15), Lesse (20), and Krukenburg(18) were four of the earlier writers to report one or more cases of this kind, and all under nearly identical conditions. So nearly do the attending circumstances coincide, that they may all be summarized in a few statements. Hæmorrhage in the latter half of pregnancy having led to a diagnosis of placenta prævia, in each case version was attempted, and at about the time when the foot was drawn through the cervical canal, the patient collapsed and died. The fatal issue occurred suddenly in three instances, but in Lesse's case the patient lived for 5 hours following the accident. Careful postmortem examinations were made in each instance; air embolism was the only apparent cause of death found. In 1910, Peters (27) reviewed the literature and was able to find twelve cases including his own. In the case reported by Esch(11), the placenta was completely detached; in five other cases, where special note had been made of this finding, partial separation had occurred.

MISCELLANEOUS

Three cases in which the uterine douche was used to free an adherent placenta ended fatally from air embolism. Braun (4) reported one case, Olshausen (24) and Huebl(16) the others. Infrequently, other obstetrical operations and manipulations have been attended by this accident. Rarely has it occurred in strictly non-operative deliveries. Cordwent's(5) case may be cited as an unusual one. His patient insisted on getting out of bed during the expulsive stage, and delivered standing. The child fell to the floor dragging the placenta

with it. The patient remained standing for a minute, then cried out and died almost instantly. The diagnosis was made at autopsy.

Davidson(7) reported the case of a Hindoo woman who had an entirely normal delivery at term; the placenta was expressed spontaneously. The patient died suddenly, 45 minutes later. The postmortem examination made 2 hours after death revealed air embolism.

From this brief résumé of cases occurring under a great variety of circumstances, it is apparent that only one condition is necessary to produce death from this cause, viz: the admission of air in sufficient quantity to the sinuses in the wall of the pregnant or recently delivered uterus.

MORBIDITY

The extreme infrequency of this occurrence is illustrated by the following: Opitz (25) in 4500 deliveries never had a case of air embolism. DeLee(8) states: "During the operation of uterine tamponade in placenta prævia the author had one case of collapse from air embolism (recovery)." Williams(32) does not mention ever having observed a case. Although admitting its occurrence, he conveys the impression that bacteriological studies would show the presence of gas-producing organisms in most of the reported cases.

BACTERIOLOGICAL EXAMINATION NECESSARY

Welch and Flexner (31), in 1896, in reporting their work on the bacillus aerogenous capsulatus, studied several cases in which the presence of gas in the vessels at postmortem had been considered evidence of air embolism, but which they demonstrated was due to gas-producing organisms. The earlier history in some of these cases is that of a severe infection rather than sudden death in a patient previously well. As an example: They describe a case of a young woman, 3 months pregnant, who had a chill, fever, and general symptoms of an infection, and who died 14 hours after the onset of the illness. Postmortem examination revealed evidence of criminal abortion, a generalized gaseous emphysema, and gas-producing organisms were recovered from the tissues. Many of the cases cited in this paper antedate the careful bacteriological studies of the present day, and for that reason cannot be considered clear-cut examples of the condition.

REPORT OF CASE

Mrs. N., age 25, white, para-II, was admitted to the hospital at 8 a.m., July 31, 1923, at term. Temperature, pulse, and respiration, normal. Previous labor 2 years before had been entirely uneventful. Her general health throughout this pregnancy had been good, and, although pus had been found in the urine on several occasions and pyelitis diagnosed, there had been no serious subjective symptoms. The present labor had begun about 4 hours before admission; the membranes ruptured at 11 a.m. One-eighth grain of morphine sulphate had been given at 1:15 p.m.

I saw the patient with Dr. A. B. Hutchinson for the first time at 4:30 p.m. She was then having strong contractions every 3 minutes; she appeared tired and nervous, but was, otherwise, in good condition, pulse 90, blood pressure 130–90. Abdominal examination revealed the occiput and heart tones on the left, well anterior, head not engaged. On rectal examination, the cervix was found partially effaced and dilated about 6 centimeters. One-eighth grain morphine was repeated at this time with scopolamine one two-hundredth grain, and patient was allowed to rest. One hour later, rectal examination revealed the cervix completely dilated except a very narrow band in front, the head still above the inlet, no other fetal part presenting.

At 5:50 p.m., preparations for delivery were begun. While these were in progress, the cord prolapsed and protruded from the vulva about 8 inches. Sterile linen was applied and ether anæsthesia begun. The cord was found pulsating, fetal heart tones 120, good quality. With the onset of the next contraction, the cord pulsations ceased, and the cord remained collapsed when the uterus relaxed. Vaginal examination at this time revealed the head still high, cervix completely dilated. Several attempts were made to replace the cord above the head, but were without success. It remained collapsed and lifeless throughout these maneuvers, and the fetal heart tones increased to 160 per minute.

The liquor amnii had entirely drained away, and the uterus was contracted down snugly around the child. Version under these conditions, attempted on a patient only lightly anæsthetized, seemed inadvisable. Simpson forceps were applied, an episiotomy was done, and the child delivered. The infant, a male, weighing 7 pounds 6 ounces, was deeply asphyxiated, but responded readily to simple resuscitative measures; at no time was there any evidence of intracranial injury.

The child had just been delivered when the anæsthetist reported that the patient had suddenly collapsed and that her pulse was extremely rapid

and thready. The placenta was expressed spontaneously, there was only slight bleeding, and no satisfactory explanation could be made to account for the serious symptoms then present.

The pulse was not perceptible at the wrist, but could be obtained easily over the abdominal aorta, and was counted at 170. It continued above 150 per minute to the end. Dyspnœa was marked for the first few hours, and then seemed less distressing. Pallor was extreme, the mucous membranes being blanched white; cyanosis developed shortly before death. Within a relatively short time after the delivery, the patient regained consciousness. She was able to answer questions for the first hour or two, then coma supervened. Dyspnœa was the only symptom complained of; no abdominal pain or tenderness could be elicited. There was no distention, no dullness in the flanks, or other findings suggestive of intraperitoneal hæmorrhage. The uterus remained firmly contracted. Repeated auscultation of the heart revealed nothing but the very rapid rate. The patient was extremely restless, tossed about continually, and required several attendants to restrain her in bed. Death occurred at 1:15 a.m., August 1, 7 hours postpartum, respiratory failure with deep cyanosis preceded the cessation of the heart action.

The postmortem examination was made 9 hours after death by Dr. H. Gideon Wells of the University of Chicago.

Postmortem report. External appearance. The body is that of a well nourished, well developed young woman of about 30 years of age. The skin is white. There is no icterus. The mammary glands are well developed and colostrum can be expressed from the nipples. Marks of saline infusion under each breast. The abdomen is prominent with pigmentation along the mid-line. Lineæ gravidarum are present. The pubic hair has been recently removed. There is slight œdema about the ankles. A laceration of the perineum is present. Body heat is still present.

Abdominal cavity. The odor of ether is perceptible as soon as the abdominal cavity is opened. There is about 1½ centimeter of subcutaneous fat in the abdominal wall at the mid-line. There are no adhesions in the pelvis, no hæmorrhages. The peritoneal cavity is everywhere normal, no excess of fluid, no signs of inflammation, and no adhesions except for a few between the gall bladder and the transverse mesocolon.

Pleural cavity. The pleural cavities are both normal. The diaphragm is at the second interspace on the right, at the third rib on the left.

Pericardial cavity. The pericardial cavity is normal, no excess of fluid, and the surfaces are smooth.

The mouth and pharynx were not examined.

The larynx and trachea were not examined.

The œsophagus was not examined.

Thyroid and thymus. The thyroid was not examined. There is a moderate amount of thymus tissue present.

Heart, aorta, and vessels. The blood is not completely clotted. The right ventricle is markedly dilated with flabby walls which appear transparent. When opened under water, the right ventricle is found to contain much free air, and frothy blood also escapes from it. The pulmonary arteries also contain frothy blood. The pulmonary arteries are free from thrombi. The heart is of normal size. The heart muscle is pale. The valves are normal. The blood elsewhere does not contain air or bubbles. There are no signs of postmortem decomposition.

Lungs. There is an old puckered scar on the right apical pleura, which represents an old tuberculous lesion. The lungs were otherwise normal externally. They were not removed or opened. Contained no areas of consolidation.

Peribronchial glands. The peribronchial lymph nodes are not enlarged, caseous or calcified.

The liver is pale and soft, but appears normal. The spleen is normal in size and appearance. The pancreas is normal. The gastro-intestinal tract is normal. The appendix is normal. The adrenals are of good size but normal in appearance. The cortex exhibits a deep yellow color and contains much lipoid. The left kidney is soft and wet. The contents of the pelvis are yellow and turbid pus, indicating a distinct pyelitis. The kidney is somewhat swollen and the cut surface bulges. The capsule strips freely leaving a normal surface. The cortical striations are normal. The right kidney resembles the left in all respects. The bladder is normal.

Generative organs. The uterus reaches nearly to the umbilicus. The cavity of the uterus is covered with clotted blood and is eroded as in recent delivery. The placenta was attached to the posterior wall. It represents a normal recently delivered uterus. The tubes and ovaries are free. The left ovary contains a corpus luteum about 15 millimeters in diameter.

Lymph glands in general. The superficial lymph glands are not palpable. The mesenteric and retroperitoneal lymph nodes are not enlarged.

The brain and meninges were not examined. The spinal cord was not examined. The musuclar system was normal. The skeleton was normal.

Histology. Microscopic examination of tissues showed no pathological changes. There was no evidence of gas bacillus infection. Examination of the blood showed no bacteria.

Anatomical diagnosis. Air embolism—air in heart and pulmonary vessels; dilatation of the right ventricle; recently delivered uterus; lactating mammary glands; corpus luteum in left ovary; scar of healed tuberculosis lesion in right pulmonary apex; acute pyelitis; acute parenchymatous degeneration in kidneys.

SUMMARY

1. Air embolism, although occurring rarely, is a grave complication of obstetrical operations.

2. In the vast majority of reported cases the possibility of gas-bacillus infection has not been definitely excluded.

3. A case is reported in which the diagnosis, made at postmortem, was verified by negative bacteriological findings.

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RUPTURE OF UTERUS[1]

By D. S. HILLIS, M.D., F.A.C.S., Chicago

BETWEEN February 26, 1923, and October 10, 1923, four cases of ruptured uterus were admitted to the obstetrical service in Cook County Hospital. There is a striking similarity between these cases; no case differed in any important particular from any of the rest. All occurred during pregnancy; in each the rupture occupied the site of a previous cæsarean section scar. The uterus was removed in each case and all patients recovered.

Case 1. A. R., white, was within 2 weeks of term in her second pregnancy. The first pregnancy terminated by classic cæsarean section at the Cook County Hospital 15 months before, on account of eclampsia and contracted pelvis with conjugata vera of 7.5 centimeters. Her puerperium was afebrile and she was discharged cured on the twelfth day.

Patient had been well during this, her second pregnancy, and while seated at the table was seized with sudden cramp-like pain in the abdomen, noticed violent fetal movements followed by complete cessation. She called a physician 4 hours later on account of the pain. The doctor prescribed medicine, and left; patient became worse and came to the hospital. She was operated on 12 hours after onset of attack.

Patient showed typical picture of acute internal hæmorrhage without external bleeding. Abdomen corresponded in size to full-term pregnancy, with much tenderness and moderate rigidity; fetal parts very prominent in left lower quadrant; outlines of uterus could not be made out. Red blood cells were 4,250,000 and hæmoglobin 80 per cent. Pulse was thready, rate 96.

Upon opening the abdomen a moderate amount of fluid and clotted blood was found. The fetus and placenta were in front of the uterus which was empty, contracted firmly down in the pelvis and was not bleeding. The uterus was removed and all fluid left in the abdominal cavity. The patient had no temperature elevation above 100 degrees during convalescence and left the hospital well on the eleventh day.

Case 2. P. W., age 28, colored, was delivered by classic cæsarean for central placenta prævia one year before at Cook County Hospital. Following this operation she ran a febrile course for 31 days with an infection of the abdominal wound, without any signs of peritoneal involvement.

Patient was admitted to hospital July 26, 1923, at end of the seventh month of her second pregnancy which was due September 26, 1923. Two days before admission she was seized with a sudden, sharp, tearing pain which increased in severity and lasted about 10 hours, then stopped and patient fell asleep. Nausea and vomiting began 4 hours after onset and persisted.

Upon examination there was marked pallor, thirst, and air hunger. Pulse 148. Temperature 98 degrees. Red blood cells 2,000,000, hæmoglobin 40 per cent and white blood cells 19,000. The abdomen was the size of a 7 months' pregnancy; distention and tympanites above umbilicus and dulness in left flank. No fetal parts or tones palpable. Abdomen contained quantity of fluid, blood, and clots; the fetus and placenta were free from the uterus which was firmly contracted and retracted and not bleeding. Hysterectomy was done. No attempt to remove the fluid contents of cavity was made. Twelve hundred cubic centimeters of normal saline solution were left in cavity. A temperature of 102 degrees developed 4 hours after operation and persisted for 48 hours when it dropped and remained normal until patient was discharged from hospital 12 days after admission.

Case 3. Mrs. B. H., age 25, white woman, had a cæsarean section at St. Joseph's Hospital 1 year ago. There was no history of febrile puerperium. She had been admitted to the Cook County Hospital in the seventh month of second pregnancy with a history of being awakened from sleep at 2 o'clock in the morning by a sudden, sharp, abdominal pain followed by marked restlessness, dyspnœa and thirst, and later severe vomiting. Upon entrance the patient showed marked pallor and all signs of profound shock; pulse about 150, thready, at times imperceptible; respiration 40; cyanosis; clammy skin and cold extremities. The abdomen was distended, fetus not palpable, indefinite mass in left flank. There was dulness over lower abdomen. Patient was given 1,000 cubic centimeters saline solution before the operation; 800 cubic centimeters blood and 1,000 cubic centimeters saline intravenously during operation.

The abdomen was filled with 2,000 cubic centimeters of dark blood. Uterus was contracted and empty; fetus and placenta free in cavity. Hysterectomy was done. Temperature, 100.4 degrees 8 hours after operation and 101.4 degrees on the ninth day. Patient went home on the eleventh day after operation with a temperature of 99.8 degrees.

Case 4. Mrs. E. P., white, age 26, in ninth month of second pregnancy. Admitted to hospital 3 p.m., October 9, 1923. At 9 a.m., same day, patient was seated in her home sewing when she suddenly became so dizzy and faint that she went to bed. Soon

[1]Read before the Chicago Gynecological Society, January, 1924. (For discussion see p. 120)

after she attempted to walk to the telephone in the same room and was found unconscious on the floor about half an hour later. Returned to her bed she noticed the first pain in this attack. Pains were general over the abdomen and cramp-like in character. Shortly after this she vomited and again became unconscious. She did not regain consciousness until some hours after the operation at the hospital.

Patient was admitted in profound shock with signs of severe internal hæmorrhage and no external bleeding. Her condition was so grave that she was sent at once to the operating room. The abdomen was found filled with blood, fluid, and clots; fetus and placenta were free in the abdominal cavity; the uterus was firmly contracted in the pelvis.

Hysterectomy was done. No blood was removed from the abdominal cavity that could be left and 800 cubic centimeters saline solution was introduced, 800 cubic centimeters citrated blood and 700 cubic centimeters saline solution were given into the vein during the operation.

The patient was up on the twelfth day and discharged on the nineteenth day after the operation.

This patient had been delivered by cæsarean section on account of eclampsia 2 years before at which time she left the hospital in 14 days but there was some discharge from the wound for about 1 month.

Fig. 1. Photograph of specimen removed from Case 4.

1. The scar of the classic cæsarean section may rupture not only during labor but at any time during the last 3 months of pregnancy.

2. Two of the cases reported had fever following previous cæsarean sections, in two the puerperium was afebrile.

3. In these cases the location of the placenta over the scar seemed to have no influence. The sections show fragments of syncytium over the scar in two and in two there are no signs of placental tissue in this location.

4. Trauma may have had a place in the etiology in one patient, Case 4. The patient fell to the floor in a faint before the pain began. The pain, severe and sharp, was the first symptom noted in the other three cases. The uterus ruptured while the patient was asleep in bed in Case 2.

5. The rupture in the cæsarean scar often allows the uterus to empty itself completely, permitting good contraction and retraction which stops hæmorrhage.

6. External bleeding was not present in any of the four because labor had not begun and the cervix was closed. External bleeding is a very common sign in rupture of uterus during labor.

7. Scar tissue was present in abundance in the sections of all of these cases and the line of rupture was in the scar tissue.

8. In each of these cases the uterus was found opened by an incision in the median line of the anterior wall extending from the upper limits of the cervix to the fundus. The contraction of the uterus held the edges of the wound so far apart that they could be approximated only with great difficulty.

9. It is believed to be good practice to remove the uterus in these cases because of the time required to freshen scar edges and the danger of a second rupture in subsequent pregnancy.

LINITIS PLASTICA[1]

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THIRTY-EIGHT cases observed at the Mayo Clinic, in which the diagnosis of linitis plastica or leather-bottle stomach was made at operation, were studied. The walls of the stomachs were thickened and hard, and had lost their elasticity. In 25 cases specimens were obtained at operation for microscopic study. Fourteen of the twenty-five specimens were diagnosed small-cell carcinoma. Six others were diagnosed as non-malignant; two of these were reported as inflammatory; one as diffuse gastritis with marked thickening of musculature, especially at the pylorus; one as fairly marked fibrosis and thickened wall; one as ulcer, greatly thickened submucosa and muscularis with marked round-cell infiltration and fibrosis, and one as single simple shallow ulcer and extensive fibrosis extending through to the serosa. The six patients died shortly after operation, and further microscopic study of the operative specimens revealed small-cell carcinoma in all. In the remaining five cases the operative diagnosis was linitis plastica, but microscopic examination revealed lesions other than the small-cell carcinoma. In one of these cases the microscopic diagnosis was syphilis; in one, simple gastric ulcer; in one, simple muscular hypertrophy; in one adenocarcinoma, and in one, colloid carcinoma.

Various lesions may produce almost identically the same gross specimen, for example, the thickened, "gristly" stomach, described by Brinton. This probably explains the difference of opinion with regard to the benign or malignant nature of linitis plastica. It probably also explains the varying results from surgical procedures.

While several lesions may sometimes present the characteristics of linitis plastica, I believe the term should be reserved for those cases in which small-cell carcinoma is found. In 80 per cent of this series of cases in which a specimen was obtained, the microscopic diagnosis was small-cell carcinoma. These cases represent the only well defined group, and if the term "linitis plastica" is not thus limited it will have to cover a multitude of conditions.

If the term "linitis plastica" is limited to the cases of small-cell carcinoma, we would not expect to find very frequent occurrence of the various factors which have been suggested as of etiological importance, namely, syphilis, tuberculosis, arteriosclerosis, alcoholism, and heart disease. And such is the case. One of our patients had been a chronic alcoholic; one gave a history of syphilis; and one had had attacks which were very suggestive of angina pectoris. None of the other patients had anything in their histories which has been suggested as a causative factor.

The youngest patient was 34 years of age, the oldest 71 years. The average age was 52 years. The one fact that stands out is that linitis plastica is a disease of the cancer age. There were 23 men and 10 women. This is in keeping with the relative frequency of occurrence of gastric cancer in men and women.

SYMPTOMS

The symptoms in these cases were similar to those in cases of gastric carcinoma in general. The average duration was 23 months. The longest was 15 years; one patient had had symptoms for 10 years, and another for 8 years. The long duration of symptoms brings up the question of whether or not this form of cancer may arise from gastric ulcer. The shortest duration of symptoms was 5 weeks. Excluding the three patients whose symptoms lasted 8, 10, and 15 years, the average duration of the illness was 10 months, which is probably more correct. The common symptoms were pain and loss of appetite, weight, and strength. Gas, belching, and nausea and vomiting were also common complaints. Several patients said that they could not eat much without feeling full. Only one patient had had gross gastric hæmorrhage. All of the patients had had pain in the epigastrium, in

[1] Abstract of thesis submitted to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Surgery, December, 1923.

Fig. 1. Generalized linitis plastica.

Fig. 2. Generalized linitis plastica. Gross specimen. Stomach opened along lesser curvature.

certain instances brought on by eating, but in almost as many instances, food gave relief. One patient had had epigastric pain with food relief for years, but 4 weeks before coming to the Clinic food began to aggravate the pain, another point which raises the question of the development of this type of cancer on ulcer.

The average loss of weight was 21 pounds.

Achlorhydria was the rule. Twenty-two patients had no free hydrochloric acid, but 8 had free acid ranging from 6 to 32. The test meal given to 3 patients was unsatisfactory.

Linitis plastica cannot be diagnosed by the X-ray. The localized form cannot be differentiated from cancer, and in the generalized form the picture is not different from that of a scirrhous cancer. The gastric cavity may be reduced to a narrow tube, and initial clearance of the barium meal is early and voluminous. Peristalsis is absent in the involved area. In the generalized form, the gastric walls are rigid and move away from the palpating finger instead of being indented by them (Fig. 1). A mass was palpated in the epigastrium in 24 of the 33 cases, but this would be expected, considering the great thickness of the walls of the stomach.

PATHOLOGY

The lesion may be localized or involve the whole stomach. The generalized form is the late stage of the local lesion. One of the patients in the series had had a gastroenterostomy because of a tumor of the pylorus with thickening along the lesser curvature. He did well for a time and then began to vomit and lose weight, and 1 year later an exploratory operation showed that the process had extended considerably. Operative procedures were not continued. The other patient had had cholecystectomy at the Clinic, and the surgeon had noted a thickening just above the pylorus, which he thought was due to extension of inflammation from the gall bladder. The patient returned to the Clinic after 2 years, complaining of epigastric pain, anorexia, nausea, vomiting, and loss of weight. Exploration at this time revealed that the entire stomach was thickened, and a diagnosis of generalized linitis plastica was made.

Certain authors have mentioned a form of linitis plastica in which the stomach is in-

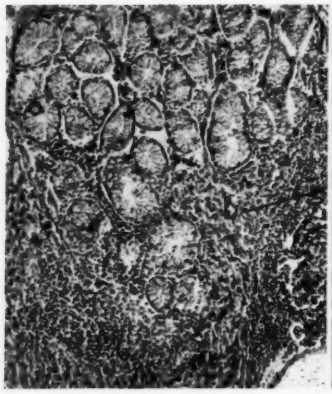

Fig. 3. Mucosa in linitis plastica: *a*, glands; *b*, cancer cells; *c*, lymphocytes. (×60).

Fig. 4. Mucosa in linitis plastica: *a*, gland; *b*, cancer cells. (×130).

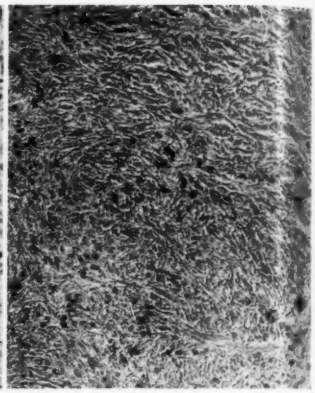

Fig. 5. Submucosa in linitis plastica. Great increase in fibrous tissue with cancer cells scattered throughout. (×60).

volved in patches. There was none such in this series. Others have reported cases in which the process also involved other viscera, particularly the intestines. Many of these cases are probably some form of polyserositis, although others are undoubtedly malignant processes. There was one such in the series. At operation the entire stomach was stiff and thickened and there were several thickened areas throughout the peritoneal cavity. There were two liters of free fluid in the peritoneal cavity. A gland was removed from the omentum, and diagnosis made of metastasis from small-cell carcinoma to lymph gland.

The involved portion of the wall of the stomach is characterized by marked thickening and loss of flexibility. On palpation it feels gristly. The peritoneum over the lesion is not transparent and glistening as normally, but pearly white. If the process is still localized and is in the pyloric region, where most of the lesions start, it may result in obstruction with dilatation of the part of the stomach proximal to the obstruction. When the process has spread so as to become generalized, the stomach usually is contracted and converted into a rigid tube. Even in the generalized form the greatest thickness and rigidity is usually near the pylorus, and the cardia is the least involved. The lesion does not end abruptly at any stage, but passes gradually over into the normal stomach.

On cutting through the thickened wall of the stomach, the different coats are clearly discernible. But even though the coats can readily be differentiated, they do not offer the same contrast as under normal conditions. The submucosa may be increased ten to twenty times its normal thickness, the subserosa and serosa seven to ten times, the muscular coat five to eight times, and the mucosa two to three times. The mucosa sometimes is wrinkled, being thrown into quite heavy rugæ. This is probably due to contraction in the other coats (Fig. 2).

Glandular involvement is relatively as common as in other cases of gastric carcinoma. In the 23 cases there were 15 with glandular involvement.

The presence or absence of ulceration could be determined definitely only in cases in which resection was performed. Ulceration was present in 5 cases. This is in marked contrast with the findings of Thomson and Graham, who found ulcer always associated with the condition.

The microscopic picture is characteristic. The mucosa may be practically normal, and is sometimes thrown into rugæ. Degenerative changes in the cells, and sometimes even ulceration may be present, resulting most probably from disturbance of the blood supply by the contracting connective-tissue fibers (Figs. 3 and 4). This connective tissue

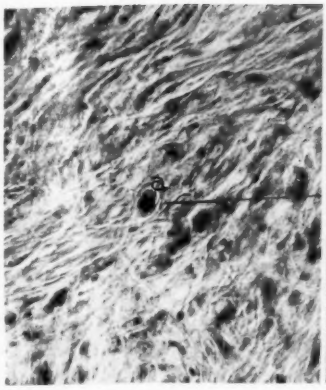

Fig. 6. Submucosa in linitis plastica: *a*, mitotic figure. The connective tissue is most abundant here and is responsible for the thickening of this coat. (×250).

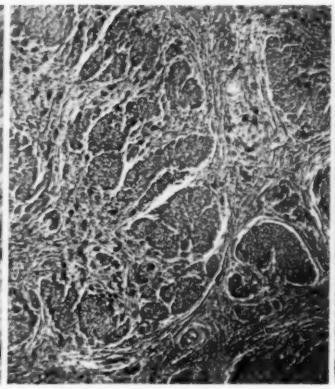

Fig. 7. Muscularis in linitis plastica. Hypertrophied muscle interspersed with bands of fibrous tissue. Cancer cells scattered through fibrous tissue. (×60).

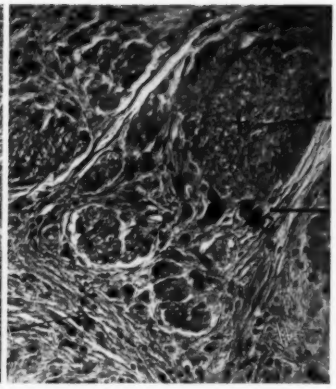

Fig. 8. Muscularis in linitis plastica: *a*, fibrous tissue; *b*, muscle; *c*, cancer cells. The muscular elements are markedly hypertrophied and interspersed by bands of connective tissue.

is most abundant in the submucosa, and is responsible for the enormous thickening of this coat, but fibers also pass from the submucosa through the muscularis and subserosa to the serosa. These fibers pass in every direction through all the coats, interlacing with each other and surrounding the blood vessels. The contraction of the fibers around the blood vessels is responsible for the "bloodless" stomach which several writers have mentioned (Figs. 5 and 6).

The muscular elements of the muscularis are markedly hypertrophied and interspersed by the bands of connective tissue extending through from the submucosa. This muscular hypertrophy is hard to explain, but is probably the result of the increased work thrown on the gastric muscle by the deposition of fibrous tissue in the walls of the stomach (Figs. 7 and 8).

The subserosa is thickened and solidified, because of the presence of the same connec-

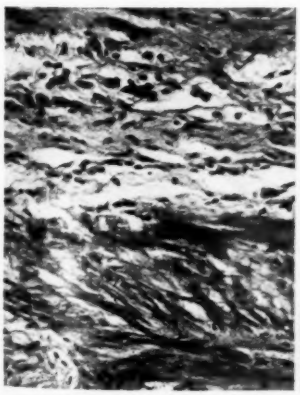

Fig. 9. Serosa and subserosa in linitis plastica. Great increase in fibrous tissue with cancer cells scattered throughout. (×125).

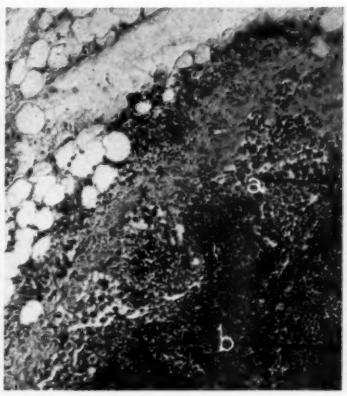

Fig. 10. Metastasis of small-cell cancer in lymph gland: *a*, cancer cells; *b*, lymphocytes; probably a high grade malignancy meeting great resistance.

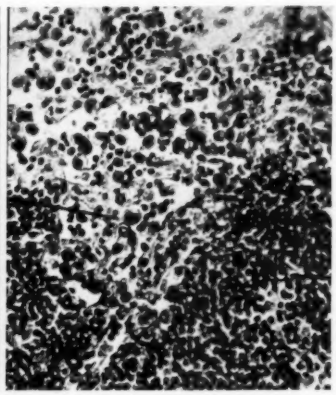

Fig. 11. Metastasis of small-cell cancer in lymph gland: *a*, cancer cells; *b*, lymphocytes. The presence of these cells aids in the diagnosis.

tive-tissue elements, with resulting obliteration of blood vessels, which in turn cause the changes in the appearance of the peritoneum, namely the loss of transparency and glistening appearance (Fig. 9).

Scattered throughout all the coats, but most marked in the submucosa, are numbers of small cells with large nuclei. They resemble epithelial cells in all respects. Practically every one writing on linitis plastica has mentioned these cells, but many, while commenting on their similarity to epithelial cells, have believed them to be connective-tissue elements. In some places they are grouped together in large masses, and in others they seem to be advancing in single file through the lymphatics. Mitotic figures are not very numerous. The process probably represents a high grade malignancy meeting with great resistance on the part of the subject (Figs. 10 and 11). The cords of cells advancing through the lymphatics of the subserosa aid in the diagnosis of the condition. The involved lymphatics of the subserosa can often be seen through the peritoneal coat as a network of fine white lines. This cannot be said to be characteristic of linitis plastica, as any type of carcinoma or tuberculosis might produce the same condition. But the presence of such a network in a case suspected to be linitis plastica would rule out syphilis or any other inflammatory lesion except tuberculosis. The latter occurs so rarely in the stomach that it need hardly be considered.

END-RESULTS

Excluding the five cases in the series in which microscopic examination revealed a lesion other than small-cell carcinoma, there were fifteen explorations, three gastro-enterostomies, and fifteen resections with six operative deaths, an average mortality of 18 per cent. Of the 27 patients who survived operation, 21 are dead.

RENAL INFECTIONS[1]

By JOHN H. CUNNINGHAM, M.D., F.A.C.S., and ROGER C. GRAVES, M.D., Boston

RENAL infection is like an evil spirit, always to be feared, manifesting itself with such frequency that it becomes one of the most common conditions with which the urologist has to deal. It is a condition we try constantly to avoid, a condition we are most concerned about treating, and a condition which, in spite of all, is the cause of death in most of our cases.

My reason for bringing this subject before you is that one of my associates, Dr. Roger C. Graves, has recently completed experimental work which is of the greatest practical importance in explaining the common occurrence of renal infection as a complication in connection with many of our patients, particularly those with urinary obstruction.

The route by which bacteria reach the kidney in cases of renal infection has been the subject of controversy for many years. The early theory that all such diseases occur as a result of direct ascent of infectious material from the lower part of the urinary tract, has been denied in many later writings. Indeed, it has given way to the view that these infections are blood-borne in every instance. The latter belief has been so firmly upheld in recent years that we have been led to feel, rather generally, that the ascent of infection along the ureter is a most remote possibility, if indeed, it occurs at all. On the one hand, there exists a paucity of evidence that ascending renal infections are clinical possibilities. On the other hand we are confronted by indisputable facts concerning the kidney and its relation to bacteria carried by the blood stream. Without further discussion it may be said that we know, both from experimentation and abundant clinical experience, that hæmatogenous infections of the kidney occur, and that they probably predominate. However, the attitude that the blood stream is the only route of invasion does not seem reasonable, in spite of the fact that, concerning the alternative, there is no positive proof. All of us are familiar with cases which suggest most strongly as ascending infection; indeed, there are repeated instances in which no other explanation seems probable. Because this is true, and because the work on this subject has left many points undetermined, it has seemed to us worth while to undertake a more complete investigation.

By ascending renal infection must be understood, of course, the passage of bacteria from the bladder to the kidney along the path of the ureter, either through its wall, or by way of its lumen. Three types are conceivable.

1. Extension upward along the ureteral wall through its lymph vessels. There is little evidence on anatomical grounds for such an occurrence, the lymphatics of the ureter being arranged segmentally instead of continuously from bladder to kidney; but even if anastomosis between segments permits a continuous lymph stream, the considerable amount of experimental work done on the subject has failed to prove satisfactorily that infection ascends along this channel.

2. Extension of infection along the lumen of the ureter through and against the column of descending urine. A passive ascent of this sort can only take place, obviously, in those cases in which disease of the ureter, distorting the intravesical segment, makes possible a free communication between bladder and renal pelvis. Such conditions exist, are fortunately not too common, and need no further comment.

3. Extension of infection along the lumen of the ureter anatomically intact, in which the bacteria are carried upward through the force of bladder regurgitation. It is this highly interesting possibility with which we are concerned, and we find that it has already been made the subject of a considerable amount of investigation.

Credit for the first efforts along these lines must be given to Semblinow, who, in 1883, determined with experimental animals that regurgitation of the vesical contents is possible under normal anatomical conditions. He

[1] Read before the Southwestern Branch of the American Urological Association in connection with the meeting of the Kansas City Clinical Society and the Medical Society of the Southwest, October 12, 1923.

produced reflux by mechanical stimulation of the ureter in a dog whose bladder had been filled with colored fluid. Further work was done in later years by Lewin and Goldschmidt, Courtade and Guyon, Marcus, Wislocki, and O'Conor. Time will not permit a discussion of their results, but they found little difficulty in obtaining regurgitation in normal animals.

In a paper concerning the hydraulic distention of chronically infected, small contracted bladders, Young, in 1898, considered the possibility of reflux, and concluded that the normal ureteral valve, and the oblique course of the ureter in the vesical wall, afforded adequate protection against it. He filled to the limit of capacity the bladders of cadavers, and failed to produce regurgitation.

In addition to this experimental work, Kretschmer in 1916 made an exceedingly valuable clinical contribution to the problem. He observed, in a study of the normal bladder by means of cystograms, that the ureters often filled with opaque solution. This regurgitation occurred three times in a series of ten normal children, under ether anæsthesia. In one adult also, with a normal urinary tract as proved by cystoscopy, reflux was shown in the cystogram. During the examination the patient had a great desire to urinate, and Kretschmer believed the regurgitation to have been the result of increased tension through straining. Reflux was again shown to occur in three cases with disease of the vesical outlet in which, however, cystoscopy had revealed what appeared to be normal ureteral orifices.

These facts, and others, together with the repeated clinical phenomena, which seem only to be explained on a basis of regurgitation, have led the authors to believe that the subject warrants more comprehensve study than it has yet been given. In reviewing the situation we find that regurgitation of vesical contents has already been established as an experimental fact, and as a clinical probability, but that little has been offered concerning the conditions under which it occurs, and the factors which produce it. With the purpose to answer, if possible, some of these questions, the experimental work by Graves here recorded was undertaken.

The technique used throughout the experiments was based upon certain fundamental procedures which we will outline in detail. In the series under discussion the experiments were carried out on male rabbits. In most instances, the animals were anæsthetized with urethane, given by means of a stomach tube, and morphia given subcutaneously. After an interval, usually of 30 minutes, allowed for satisfactory anæsthesia, the animal was placed in a warm chamber in which body temperature was maintained by a thermostat and equalized throughout by means of a small electric fan. A mid-line incision opened the peritoneum from ensiform to pubes. The rectum was usually doubly tied and cut and the intestines were reflected upward and to one side where they were enclosed in a towel moistened with warm physiological salt solution. For this procedure it was only necessary, in addition to dividing the mesocolon, to ligate and cut the inferior mesenteric artery. The vessel was divided peripheral to the inferior mesenteric ganglion and its fibers. In this way the bladder and the ureters throughout their extent were exposed to view. The tissues were kept moistened with physiological salt solution at body temperature. To exclude the possible effects of a shock, a few experiments were performed in which the rectum was not cut across, the intestines being merely turned aside to expose one ureter, and we found this preparation no more favorable for the production of regurgitation than the other. In numerous cases the abdomen was not opened at all until the close of the experiment. The bladder was emptied of its contents through a small soft rubber catheter passed along the urethra. When all preparations were complete we usually allowed an interval varying from 15 to 45 minutes before actually beginning bladder filling. During this period body temperature was re-established in the chamber if any slight drop had occurred. Moreover, and perhaps of greater importance, the bladder musculature was given a rest period in the empty state.

From a burette, the maximum hydrostatic pressure of which was about 50 millimeters mercury, the solution to be used was slowly

introduced through the catheter into the bladder. The fluid in all cases in this series was physiological salt solution (.85 per cent) colored with small quantities of methylene blue or India ink for purposes of increased visibility. A coil of tubing immersed in a water bath and inserted between the burette and the catheter, served to maintain body temperature in the solution introduced. The rate of flow into the bladder ranged from 1 to 2 cubic centimeters a minute. A mercury manometer in open communication with the system made it possible at all times to read intravesical pressure. Filling was continued until positive results were obtained or until such time as further filling would have been beyond physiological limits of distention.

SERIES A: A SERIES OF NORMAL RABBITS THE BLADDERS OF WHICH WERE FILLED WITH WARM PHYSIOLOGICAL SALT SOLUTION

In this series are included experiments upon 75 male rabbits with a total of 76 bladder fillings. It was our purpose to simulate as closely as possible the normal vesical distention. Body warm physiological saline was slowly introduced and trauma in the preparation of the subject was reduced to a minimum. By this means we were able to secure regurgitation of vesical contents into the ureter in a total of 73.7 per cent of cases. Most of the failures occurred in the early stages of the work when we were less familiar with the technique of preparation. In the second half of the series we produced regurgitation in 86.8 per cent of the attempts. A typical experiment proceeded about as follows: At the beginning of bladder filling both ureters were acting vigorously, each presenting three peristaltic waves per minute, and each wave obviously accomplishing the transportation of a considerable amount of urine. When ten cubic centimeters had been introduced into the bladder the ureters were still active and the bladder was elongated and apparently resisting distention actively, as shown by its cylindrical form. Pressure: 5 millimeters mercury. With 20 cubic centimeters the pressure was 9 millimeters mercury. The bladder was quiet, and both ureters were active. With 26 cubic centimeters there was

Fig. 1. Bilateral pyelogram made by normal unanæsthetized animal, through regurgitation of vesical contents.

a sudden rush of a blue column of fluid from the bladder into the left ureter filling its lumen to the kidney. Similar reflux soon followed on the right. Pressure: 18 millimeters mercury. Ureteral waves rapidly increased in frequency, now acting 8 to 10 times a minute. At first these waves successfully pushed the blue columns downward. Gradually, however, the contractions grew less effective until finally the ureters, becoming more and more feeble, lay blue and motionless.

Thus, we have demonstrated again, conclusively, that regurgitation of vesical contents is an experimental fact. To be sure, as we have previously stated, so much has been shown by earlier workers, but there has thus far been no satisfactory explanation of the phenomenon. As it has been our purpose to determine if possible the conditions under which reflux occurs, a careful review of the results of the present "normal" series will be of value.

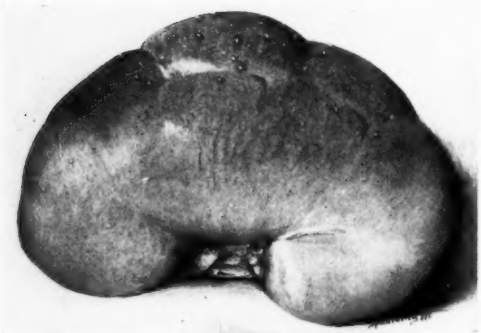

Fig. 2. Acute inflammation of the kidney with abscess formation. Note large congested kidney with abscesses, with areas of acute congestion surrounding them.

Fig. 3. Acute inflammation of the kidney with abscess formation. Note abscesses in the cortex and pyramids.

Concerning anæsthesia, suffice it to say that nine different combinations were used of urethane, paraldehyde, morphine and ether. As far as could be determined, the type of anæsthetic, and the fact of anæsthesia as such, were of relatively small importance.

It was of interest to observe the varying amounts of urine present in the animals at the start of the preparation. In 53 of the 73 cases the bladders were either empty or contained 10 cubic centimeters or less. In 88 per cent of these cases regurgitation occurred while in those cases in which the bladders contained moderate or large amounts of urine only 44 per cent showed reflux. From this experience it appears to us that at a given time any given bladder possesses the ability to raise and maintain a definite pressure with a given quantity of fluid, entirely different from the pressure which the same bladder can develop at another time under different conditions.

The vermiform activity of a filling bladder is caused by rhythmic contractions of the musculature, stimulated by gradually increasing distention. As the upper limits of intravesical tension are approached, these rhythmic movements cease to be apparent, and in their stead occurs a sustained contraction of the bladder wall upon its contents. It is in this tonic state that pressure within the bladder rapidly rises until such levels are reached as render reflux possible. In this period of rhythmic activity, the muscle fibers are lengthening as filling proceeds. The intermittent contractions represent a sort of clonic response to the stimulus of stretching or distention. Later, further stretching is continuously resisted, and the state of tonic sustained contraction is reached. In other words, the bladder apparently at first responds to the gradual filling isotonically, that is, by increasing the length of the muscle fibers without changing the tension (except for the periodic contractions described above). Finally, when a sufficient quantity has been introduced, the response becomes isometric; the fibers maintain the same length and respond to the stretching force by a rapidly increasing tension.

Our experiments demonstrate the fact that reflux is attained most rapidly in those bladders in which the response tends to be isometric from the start. In some cases tone was so active and the isometric state was reached so soon that intermittent contractions were not observed at all, and in these cases reflux pressure levels were developed with surprisingly small quantities of fluid. In a majority of the experiments, however, a rhythmic activity preceded the final tonic resistance to filling. A third type of bladder occurred, so lacking in tone that muscular contractions failed to appear at all, or did not get beyond the rhythmic state. These bladders presented no active resistance to filling, and in them the pressure finally engendered was purely a passive mechanical tension, produced because the sac could hold no more. In such cases, regurgitation never occurred.

The average quantity of fluid used in bladder filling in this series was 49 cubic centimeters and in the second half of the series, 30 cubic centimeters. These quantities are not excessive in rabbit bladders, for we have frequently found much larger quantities of urine in these animals at the time of preparation. Moreover, intravesical tension does not depend primarily upon the amount of fluid in the bladder, but rather upon the tone of the bladder musculature. The average intravesical pressure at the time of reflux, throughout the series was 13.6 millimeters mercury. The lowest regurgitation pressure was 4 millimeters of mercury; reached with 11 cubic centimeters of fluid (experiment No. 91).

In passing it may be mentioned that this work has afforded particular opportunity to observe the effect of bladder distention upon ureteral activity. When the bladder begins to fill there is a speeding up of peristalsis. With greater degrees of retention and increased intravesical pressure, the ureter acts more slowly, but more vigorously. Where intravesical pressure has reached a relatively high level, the organ again speeds up in frequency, but becomes dilated and increasingly ineffective in emptying its load. Finally fatigued and overdistended, its waves become mere ripples and eventually cease. In other words, there has developed a ureteral retention which is inevitably associated with bladder retention, a fact too little regarded in clinical considerations and one which gives definite significance to the term "back pressure" in prostatic obstruction.

Keeping still in mind the question of back pressure, it seems to us of especial interest that after regurgitation the bladder pressure is transmitted directly to the renal pelvis, the two structures being in open communication. This we demonstrated in six cases in which we measured the intrapelvic pressure by means of a water manometer. The latter was attached to a small cannula, passed into the pelvis through the kidney parenchyma. The average bladder pressure at the time of regurgitation in these cases was 21.8 millimeters mercury, while the pelvis pressure was 26.9 millimeters of water or about 20.7 millimeters mercury, the difference not being beyond the limits of error. When the vesical tension is reduced, pelvic pressure remains elevated until the ureteral contractions produce sufficient emptying to lower it. No reduction in pelvis pressure occurs, if the ureters remain inactive. In experiment No. 121 for example, reflux occurred with a bladder pressure of 22 millimeters mercury. Pressure in the renal pelvis promptly rose to the same level. Upon emptying the bladder the ureteral orifice apparently closed, and no waves occurred in the ureter, for pelvis pressure still remained 22 millimeters mercury.

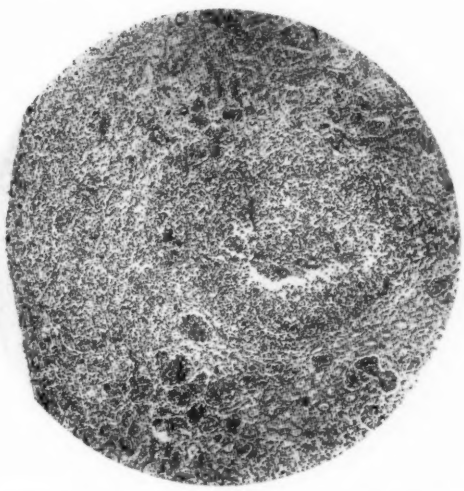

Fig. 4. Acute inflammation of the kidney with abscess formation. Note miliary abscess tubules filled with polymorphonuclear leucocytes.

SERIES B: RABBITS IN WHICH THE URETERS HAD BEEN DISTURBED IN PREVIOUS OPERATIONS

This group consisted of 42 bladder fillings in 38 male rabbits. In each case the normal conditions existing in one or both ureters had been disturbed in a previous operation, performed either some weeks before or immediately preceding the experiment. In 15 animals the operation had produced obstruction in the left ureter, varying in degree from slight to absolute obliteration of the lumen, by means of aluminum or elastic bands and silk ligatures. In 18 cases the ureters were doubly

Fig. 5. Acute inflammation of the kidney of diffuse type. Note areas of acute inflammation.

Fig. 6. Acute inflammation of the kidney of diffuse type. Note areas of acute inflammation in the cortex streaked downward toward the pyramids.

tied with silk and cut across, just before the beginning of the experiment. In 5 rabbits, the left kidney and ureter were dissected free from all nerve and blood supply down to the bladder wall itself, in order to render that side entirely motionless. Otherwise, the conditions of experimentation were essentially the same as in Series A.

Taking the series as a whole, we succeeded in producing reflux in 33 of the 42 attempts. Of the 5 in which the left side had been rendered motionless, regurgitation occurred in four. Of the 18 cases in which the ureters were doubly tied and cut, reflux was obtained in 12; and of the 19 vesical fillings in the remaining group, 17 resulted in regurgitation.

Obviously then the degree of ureteral activity is of slight importance in the production of regurgitation. In further sharp contrast to the beliefs of other workers, it may be said that reverse peristalsis of the ureter was found to have no part in the phenomenon.

SERIES D: ROENTGENOSCOPIC OBSERVATIONS

It has been our desire to produce regurgitation under conditions as nearly normal as is consistent with experimental study. In order to eliminate as many as possible of the artificial factors, we have made a series of observations on perfectly intact animals. This we accomplished by fluoroscopic examination. Aside from an eighth grain of morphia, and a whiff of ether during the adjustment of the catheter, no anæsthetic was used. The animals were placed upon the X-ray table and the bladders were slowly filled with warm 25 per cent sodium bromide solution colored with India ink. Observations were made at brief intervals by means of the fluoroscopic screen until regurgitation was seen, or until it was obvious that the phenomenon was not to take place. At the close of each experiment, laparotomy was performed, under general anæsthesia, in order to confirm our findings. Six of the 11 animals studied by this method showed unmistakable regurgitation under the fluoroscope. X-ray films were exposed for permanent records (Fig. 1).

In conclusion it may be said briefly that the chief factor in the production of regurgitation lies in the bladder, for the one indispensable requisite without which we have never been able to obtain reflux, is active tone of the vesical musculature. We believe that tonic contraction of the bladder wall against the distending fluid, particularly in the presence of vesical-neck obstruction, is able to open the ureteral orifice sufficiently to permit regurgitation to occur.

From the foregoing experimental work, and from many clinical observations, we hold the opinion that ascending renal infection must be recognized as a clinical entity, and that regurgitation of infected bladder urine must be held accountable for certain clinical phenomena which we, as urologists, frequently witness in the care of our patients.

The following clinical observation is one which we have frequently noted, and I have no doubt is also familiar to all present. An individual whose ureteral orifices have been previously determined to be normal by cystoscopy, has a suprapubic prostatectomy per-

formed. The convalescence has been uneventful, and the temperature has been normal. The suprapubic drainage tube has been removed, and just at the time when the sinus closes, and before the normal act of urination has been well established, there occurs a chill, followed by a sudden sharp rise in temperature, and the usual symptoms and signs appear, which we recognize as renal infection, commonly called pyelitis.

In this situation under discussion there has been no change in the condition or treatment of the patient prior to this phenomenon, and no new areas for absorption have been produced by instrumentation, or in other ways, which might make probable a blood-stream infection. We believe that this picture is one of ascending infection, and that it can only be reasonably explained on the basis of ureteral regurgitation. A case history, by way of illustration, might be of interest.

CASE 1. S. T. E., a doctor, age 61, had had the usual progressive symptoms of prostatism for a period of 5 years. Examination showed benign hypertrophy of both lateral and a small median lobe; and residual urine 6 ounces, clear and sterile, and essentially normal by urinalysis. Cystoscopy showed besides bilateral and median lobe hypertrophy, a bladder capacity of 12 ounces. Bladder musculature and mucosa were normal, and both ureteral orifices were normal. Pre-operative preparation by indwelling catheters for 10 days; subsequent bladder infection of mild character, but without developing any febrile state. Ten days drainage and the renal pre-operative treatment showed renal functions and blood chemistry to be essentially normal. A one-stage suprapubic prostatectomy was performed and the specimen, removed in one piece, proved to be benign hypertrophy. After a slight rise in temperature lasting a few days the temperature continued normal. The pulse was 80 and respiration 20; and the urine was acid, slightly cloudy from pus, and over 60 ounces in the 24-hour amount. The suprapubic tube was removed on the twelfth day, and no urethral drainage was established. The patient voided for the first time on the twentieth day after operation, although a small amount of suprapubic drainage continued until the twenty-fourth day, when the suprapubic wound ceased to leak. This patient was instructed, as is our custom, to try to urinate every hour, so as not to have much intravesical pressure.

On the twenty-fourth day after operation, the day the suprapubic sinus ceased to drain, the patient developed a severe chill, rise of temperature to 104 degrees F., and pulse to 108, and severe pain in the right kidney region. There was no noticeable change in the urine. Catheter drainage was established the following day. The patient was acutely ill with unquestionable right kidney infection. Five days after the onset the temperature dropped to normal for the first time, and with a gradually less active evening elevation for a total period of sixteen days, stayed normal, and all signs of tenderness disappeared from the right kidney region. Catheter drainage and bladder irrigation four times a day were continued for twelve days after the onset of the renal infection, as it is our feeling that renal infection requires free ureteral drainage, and the bladder should be made passive in its activity. To bring this about catheter drainage has been routine where this phenomena has occurred.

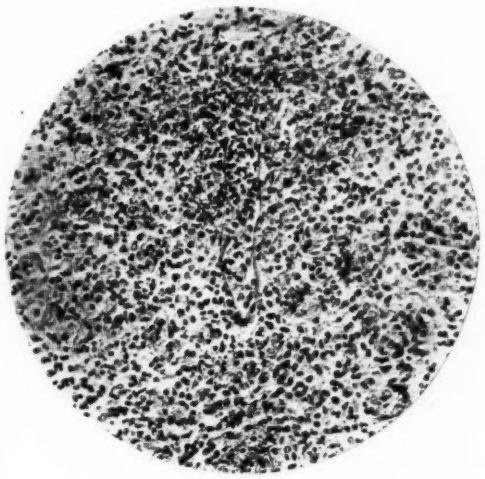

Fig. 7. Acute inflammation of the kidney of diffuse type. Caused by colon bacillus. Note that the lesions consist of inflammatory exudation, endothelial leucocytes with considerable fibrin formation, and few polymorphonuclear leucocytes. The exudation is both in the tubules and between them. There is no tissue solution.

This clinical picture which we have described not only occurs in the postoperative course of prostatic patients, as above discussed, but the regurgitation of infected urine may also take place and give rise to the same clinical phenomena during bladder drainage with an indwelling catheter which becomes temporarily blocked. I believe, as we refresh our recollections, that we can all recall patients who have been doing well under catheter drainage, who suddenly, and for no apparent reason, develop the familiar sequence of chill, fever, and pain in the region of the kidney. The onset of the renal infection has been

evident enough, but its manner of production has not always been so readily explained, as there seems no reason that such a sequence of events should be brought about by a blood-stream invasion by organisms. Very often in these cases close questioning will elicit the fact that prior to the chill the patient has experienced a sense of bladder distention, produced because the catheter has ceased to drain.

Under these circumstances the catheter has become an obstruction to the outflow of infected urine from the bladder, and has produced a tonic spasm of the bladder musculature, and a consequent reflux of infected urine up the ureter to the kidney.

In addition to the occurrence of ureteral reflux and renal infection under conditions which we have described, regurgitation of infected urine must be considered a factor of great importance in producing renal infection, even before any form of treatment is instituted, and may be accepted as an explanation of renal infection associated with vesical-neck obstruction in patients whose ureteral orifices appear normal by cystoscopic examination.

By whatever path the kidney is infected, whether through ureteral regurgitation, or through the blood stream, the infection varies in degree from a mild pyelitis or pyelonephritis, to those more advanced conditions involving much kidney tissue, and even extensive kidney destruction.

That hæmatogenous infection of the kidney must be considered the most common, is not questioned. The differentiation from those ascending is usually difficult. The absence of any vesical-neck obstruction and the presence of any septic foci demonstrable anywhere in the body, naturally leads to a belief that any particular instance is due to organisms gaining entrance to the blood stream, and reaching the kidney by this path.

The absence of positive bacterial findings in blood cultures in such cases does not preclude this avenue of invasion. It is interesting to note in this connection, that organisms may be recovered from the blood stream during the period of the rigor associated with the onset of the renal infection, and following this rigor the organisms are absent from the blood, which makes it probable that the rigor is an expression of the blood-stream invasion as in some other diseases, such as malaria.

The renal disturbances of hæmatogenous origin may vary in their severity from a very mild to a most severe inflammatory change.

In a paper before the American Association of Genito-Urinary Surgeons in 1912, and in subsequent papers, before the genito-urinary division of theAmerican Medical Association, and before the New York Academy of Medicine, one of the authors (Cunningham) recorded five cases of acute unilateral hæmatogenous infection of the kidney of a suppurative type, originally described by Brewer, for which nephrectomy was performed as the only means of saving the patient's life, because of the severity of the infections, and the progressive toxæmia resulting from them. Since that time eight other cases of this form of renal infection have been observed and treated in the same manner without any fatalities.

In these same communications, there was recorded another group of six patients with severe unilateral, diffuse, non-suppurative inflammation, who were operated upon because of the severity of the infection. In this group nephrectomy was not always necessary. Since that time there have been observed 18 patients of the same group who have required operative procedures in the form of decapsulation, puncture and drainage of infected areas, and in some drainage of the renal pelvis.

There was also recorded in these communications, a large group of patients who were border-line cases, in the non-suppurative group, who were treated by palliative measures. Of course the great majority of renal infections fall into this last group, and vary greatly in the degree of kidney tissue involved and the severity of the symptoms produced.

It is felt now, as then, that renal disturbances of hæmatogenous origin fall into these three classes.

The pathology of acute inflammatory nephritis of hæmatogenous origin results from the invasion of the kidney by certain micro-organisms, in particular by the pyogenic cocci and the colon bacillus. It is theoretically of a metastatic nature, the nidus of infection often

being some suppurative process not infrequently in the form of a boil, carbuncle, infection of the tonsil, teeth, and enteritis. In many instances, however, the nidus from which the organism gained entrance to the blood stream is undiscovered.

The pathology of acute unilateral hæmatogenous infections of the kidney is quite different from the acute bilateral kidney infections. The latter is an expression of a general septicæmia or pyæmia in which the kidneys may participate. The former, the acute unilateral kidney infections of hæmatogenous origin, is not a part of general pyæmia, but finds its origin in the lodging of a minute embolus, carrying one or several organisms, in the terminal vessels of the kidney. It is probable that as a rule the process is started by a single micro-organism. The condition starts *not* by multiple simultaneous infections throughout the kidney, as the lesions observed in the kidneys removed at operation and postmortem might suggest, but as a single focus in the cortex of the organ. When the organisms settle in the minute capillary vessels of the glomerulus, an inflammatory reaction is set up around the glomerulus and the surrounding tissue is infiltrated with the products of inflammation. From the primary focus of infection other areas are secondarily involved by the infectious material gaining access to other tubules, to the lymph spaces and through the vessels in the connective-tissue stroma. The infection thus is more or less rapidly spread through these channels to other parts of the organ.

Concerning the pathology of ascending renal infection there is no such accurate picture. From a practical standpoint it is probably a fact that lesions of the suppurative type rarely occur. Much work has yet to be done before the pathology of ascending infection is placed on the same basis of understanding as is that of hæmatogenous origin. Valuable laboratory information has already been obtained, but is insufficient for definite conclusions. It is a subject in which we are actively interested, and will be the subject of later reports.

The renal pathology produced by a blood-stream infection is of two distinct types: (1) *abscess formation;* (2) *a diffuse inflammatory process without breaking down of tissue.*

In the former type of the disease, *abscess formation*, the kidney is found somewhat enlarged from congestion, and disseminated through its substance are small separate foci of suppuration or miliary abscesses surrounded by areas of congestion. In the early stages of this disease these minute abscesses are often observed in the cortex just beneath the capsule. From here other parts of the organ are secondarily involved, as previously mentioned. If the process continues, these foci may enlarge, coalesce, and form abscesses of larger size, which may rupture the kidney capsule, invade the perirenal fat, and result in a perinephritic abscess. For the infection to complete this cycle the resistance of the individual must be great and the virulence of the infecting organism comparatively slight, as the systemic toxæmia from this disease is often rapid, and death may occur before the process develops to this stage. The organisms which we have found producing this form of kidney inflammation are the pyogenic cocci, the staphylococcus pyogenes albus and aureus, and the streptococcus pyogenes.

The gross specimen and histology of this fulminating form of the disease is seen in Figures 2, 3, and 4.

The second type of the disease, and by far the more common, *is a diffuse inflammatory process*, spreading through the kidney substance, but not resulting in focal abscesses or solution of tissue, having the same sequence of development in its pathology as when of hæmatogenous origin. This type of the disease presents a pathology more commonly the result of an ascending infection. The difference in the severity of the process of the non-suppurative type probably depends upon the lesser virulence of the infecting organisms; the bacillus coli being the organism usually recovered. Whether or not it was the original organism producing the inflammation may be open to debate. The kidney is found to be enlarged from congestion. There may be subcapsular areas of more or less acute reddening, and on section the organ is found to present irregular circumscribed acutely red-

dened or pale yellowish areas involving the cortex and pyramids, or involving nearly the whole organ, but without solution or tissue. In the early stage of the process these isolated areas are distinct and are seen as irregular acutely reddened patches, with the edges streaked downward into the pyramids. As the inflammatory process subsides, these areas lose the acute red color and are replaced by tissue of a paler character. In some instances the whole kidney may present an acutely reddened surface due to the acute process involving the whole organ. This form of the disease undergoes resolution without focal degeneration of tissues, and when seen after the acute process has subsided, presents paler areas dependent upon the stage of the connective-tissue repair process, and forms the scar areas which are sometimes observed in kidneys when operation is being performed for other reasons. The gross specimen and histology of the condition in the acute stage of this type of the disease is seen in Figures 5, 6, and 7.

By studying the *clinical course* of these two forms of the disease, it becomes evident that the clinical signs differ in some respects, and each has a definite relation with these two different pathological conditions. The subjective and objective signs which the patient presents should suggest the type of process at work in the affected kidney. These two types of the infection should be recognized upon inspection of the diseased organ at the time of operation, if undertaken, for experience has shown that these different types of infection do not require the same form of treatment. While the kidney containing numerous focal abscesses and producing profound toxæmia requires nephrectomy, less radical measures suffice in the diffuse non-suppurative form of inflammatory infection.

Clinically the picture which unilateral multiple abscess formation produces is one rarely observed by the urologist for the reason that the acute onset of this type of kidney infection simulates more commonly acute gall bladder disease, ruptured duodenal or gastric ulcer, and appendicitis, with the result that the patient usually comes under the care of the general surgeon. The failure to appreciate the nature of the disease and the fact that the symptoms and signs are those of acute intra-abdominal inflammation, has frequently led to the error in diagnosis just mentioned, and intra-abdominal operations have failed to disclose the true nature of the patient's condition.

One of my patients was a young woman, admitted to the hospital late in the night, with acute abdominal symptoms of about 24 hours' duration. I was called to do an emergency laparotomy. The patient had been seen by several of the house-staff who were accustomed to seeing acute abdominal conditions. She was extremely sick, the appearance, temperature, pulse, and high leucocytosis indicated sepsis. The urine was essentially negative. Little history could be obtained, because of the patient's poor condition, and upon my arrival I was presented with the probable diagnosis of a ruptured, gangrenous gall bladder, with peritonitis. The patient's abdomen was generally distended, rigid on the right side, with tenderness and spasm in the right upper quadrant, but there was also unquestionable right lumbar spasm, and exquisite costovertebral tenderness. Upon the latter sign I ventured a diagnosis of acute hæmatogenous infection of the right kidney with multiple abscess formation. The house-staff had never seen such a case and were skeptical. I opened the abdomen and found it negative. I then exposed the kidney, which was as I had believed. It was removed, and the patient recovered.

The clinical picture which multiple abscess formation produces is an acute condition, usually ushered in by a chill. There is a rapid rise of temperature ranging from 102 to 105 degrees F., an early acceleration of pulse rate, usually to 120 or higher, occurring often within twenty-four hours following the onset. The picture of sepsis or toxæmia and a high leucocytosis develops rapidly. Pain on the side of the affected organ, abdominal tenderness, muscular rigidity and spasm is found on the affected side. Lumbar tenderness, rigidity and spasm are pathognomonic signs of the disease. The abdominal signs are similar to those occurring in acute affections of the appendix and gall bladder, and in ruptured

duodenal and gastric ulcer, for which the disease of the kidney under consideration is often, if not usually, mistaken. Unfortunately the urine in this disease does not excite suspicion of the true condition, as it is usually quite normal in its gross and microscopical appearance, and generally contains but little albumin and only a small amount of pus and blood cells, because the abscesses find no avenue of escape through the collecting tubules, which are either plugged by the product of inflammation or compressed by infiltrated tissue surrounding them.

When the infection is severe, the patient grows progressively and rapidly worse, the toxæmia becomes profound, delirium sets in, and there is a fatal termination within a few days, unless the body is rid of the infected organ. This form of the disease I have observed in 13 cases, one of which is given as an example.

CASE 2. Woman, 38 years old, on March 27, 1912, entered the gynecological service of the Boston City Hospital under the care of Dr. Franklin Newell and Dr. Ernest Young. The past history was negative with the exception that 1 year previously both tubes, ovaries, and the appendix were removed for acute inflammation.

The illness for which the patient came to the hospital was characterized by severe pains in the right upper quadrant of the abdomen and back; by chills, fever, and vomiting beginning 3 days before entrance and gradually increasing in severity. The temperature at entrance was 103.4 degrees F., the pulse 120, and leucocytosis 28,000. The general condition of the patient was poor. The physical examination showed a flushed face, throat and lungs negative, anæmic murmur in the heart. The abdomen was not distended but showed general tenderness in the right upper quadrant and in the right loin. There was rigidity of the right rectus and lumbar spasm. Vaginal examination was negative. The urine was turbid, 1,020, acid with slight trace of albumin, but no sugar or bile. The sediment was small in amount, and consisted of an occasional blood corpuscle, pus, and epithelial cells. The patient's condition became progressively worse during the following two days, and on the third day after entrance to the hospital (6 days after onset of the trouble) it was extremely bad. At this time the writer saw the patient in consultation with Dr. Ernest Young. Her appearance was that of profound sepsis, pulse 130, of poor quality, temperature 103 degrees F. There was rigidity of the right side of the abdomen, with marked tenderness over the right kidney in front and back. The urine at this time was only turbid, and contained but little pus. The leucocytosis was 18,000. It was believed that the patient had a septic nephritis or a perinephritic abscess. Operation was advised as the only chance for life, although the risk was considered great.

A lumbar incision was made, the perinephritic fat found infiltrated with cloudy serum but no pus. The kidney was exposed and delivered. It was twice normal size, congested, and over the surface were scattered many focal abscesses from 1 to 5 millimeters in diameter. The pedicle was clamped and the kidney removed. No attempt was made to tie the pedicle on account of the poor condition of the patient, stimulation and salt solution being required during operation. The clamp was left on the pedicle, the wound drained by a spiral tube with gauze, and the wound partially closed.

Twenty-four hours after operation, the patient's temperature dropped to 100 and the pulse to 110. The improvement in appearance and general condition was perceptible. The clamp was removed from the kidney pedicle on the sixth day. The patient made an uneventful recovery.

The pathological report was acute inflammation of the kidney, with multiple miliary abscesses from which the staphylococcus pyogenes was recovered.

The *clinical picture* produced by the more common non-suppurative infectious nephritis is a *diffuse inflammatory process* within the kidney *without abscess formation* and differs from that with abscess formation chiefly in the severity of the symptoms. The onset may be sudden, as in the former type, the temperature rising rapidly to 102 degrees or more, associated with acceleration of the pulse rate. A leucocytosis is always present, often high. A chill may accompany the onset. Pain in the loin on the affected side is an early symptom, sometimes indefinite but often severe, varying according to the severity of the process. Tenderness over the kidney in the costovertebral angle, with some muscular rigidity and abdominal tenderness and rigidity on the affected side are constant signs. The chief feature differentiating this form of the disease from that of abscess formation is the lack of progressive toxæmia, and the presence of more abnormal elements in the urine. These patients, while appearing acutely ill, do not have the real progressive toxic course which characterizes the other form of the disease. The illness after the first few days following the onset may gradually subside, if the infection is not very extensive, or remain more or less stationary, and may con-

tinue not unlike a beginning typhoid fever. The pain, tenderness and muscular rigidity may become gradually more pronounced, and the temperature, pulse, and leucocytosis elevated; or the different signs may gradually decline. Pain on the affected side may persist indefinitely, and recurrences of the acute symptoms are not uncommon.

An illustration of a severe form of the disease is as follows:

CASE 3. A woman, 43 years old, thirteen years ago had had a severe illness characterized by pain in the right side of the abdomen and back, fever, chills and cloudy urine; and had stayed in bed several weeks. Since that time she has had several similar attacks which confined her to bed for from 2 weeks to 3 months, and different physicians who cared for her have considered that in these attacks she was suffering from peritonitis. Some advised operation which the patient refused. Between these attacks there has been constant pain, varying in severity, in the left kidney region. Several X-ray examinations have shown nothing abnormal. Four years ago the patient had a small amount of blood in the urine during one of these attacks. This occurred again 2 years ago. It never lasted more than a few days.

On February 2, 1912, the patient was cystoscoped and a collargol injection and roentgenogram were made of the left kidney. The cystoscopy showed the bladder to be normal in all respects, both ureteral orifices were normal, and the catheters were passed to each kidney. The specimen of urine collected showed that from the right side to be normal, and that from the left to contain a few leucocytes, normal red cells, and caudate epithelial cells. The only organism received was the bacillus coli. The capacity of the renal pelvis was 14 cubic centimeters. The roentgenogram of the injected kidney showed it to be normal.

On February 14, 1912, the writer again cystoscoped the patient, and found the condition as previously stated. An injection of 6 millimeters of phenolsulphonephthalein showed the dye to appear on the right side in 6 minutes, on the left in nine minutes. The total amount recovered in 2 hours was, right 25 per cent, left 10 per cent. On account of the persistent pain an exploratory examination of the kidney was undertaken. Temperature at the time of operation was 102.2 degrees F., pulse 100, leucocytosis 8,100. The operation was performed February 16, 1912. An anterior incision was made. The peritoneal cavity was opened and explored. Nothing abnormal was found. The peritoneum was closed and stripped toward the median line, exposing the left kidney retroperitoneally. The perirenal fat was adherent to the kidney capsule. The kidney was but little larger than normal. Several grayish depressed areas were seen beneath the capsule. On section it showed many pale grayish, sclerotic areas, some near the cortex, others in the pyramid. The remainder of the kidney was reddish yellow, and there were acute red streaks near the apices of the pyramids.

In view of the history these areas were considered to be old organized foci of acute inflammation. It was believed that the persistent pain following the acute attack was probably to be explained by these contracted areas, and the kidney was therefore removed.

Pathological report is as follows: The surface presents several opaque grayish areas which are depressed and contracted. Some of these areas are surrounded by a small area of injection irregular in outline. On section several similar but smaller opaque areas not surrounded by areas of injection are seen scattered through the kidney substance. Near the upper pole is seen an area 2 centimeters in diameter, symmetrical and definite in outline, containing another area which is apparently a blood clot. The capsule of the kidney strips easily, leaving a red surface in places. The cortex measures 6 millimeters and the glomeruli are indistinct. The histological diagnosis is acute, diffuse inflammation of the kidney, with healed areas.

It must not be inferred that it is our feeling that the majority of renal infections produce the extreme pathological processes, or the severe clinical pictures which the foregoing description of pathology and illustrative cases portrays. These two severe types illustrate the suppurative fulminating infection, and the severe form of non-suppurative diffuse inflammation, and are simply illustrative of the severe grade of inflammation which may take place. The milder types we feel should be interpreted as lesser grades of the same pathological processes.

The common inflammatory process in the kidney is seldom so extensive, and the symptoms following the onset subside more rapidly, assuming a more or less chronic form. It is these relatively mild renal infections with which we, as urologists, commonly deal, and which are amenable to milder measures, such as forced fluids, urinary antiseptics, free catharsis, and, in the more obstinate chronic cases, lavage of the renal pelvis.

Finally, wherever a nidus of infection can be discovered in tonsils, teeth, or other organs, it is of primary importance to determine such a focus and destroy it; a matter too often disregarded. Moreover, it is fundamental that whatever obstruction to free drainage has produced stasis and lowered resistance

within the urinary tract, should be eradicated, for without the relief of causative factors, any form of treatment may be of little permanent value.

CONCLUSION

Renal infections, of paramount importance to the urologist, can no longer be considered as solely of hæmatogenous origin. Regurgitation of the bladder contents in the presence of vesical-neck obstruction has been shown to make possible an invasion of the kidney through the ureter from the lower portions of the urinary tract.

The pathological processes produced by renal infections, ascending or hæmic, may be in all gradations from simple to most diffuse, and even suppurative forms.

Treatment, as always, must be measured in terms of the disease, and varies from radical surgical intervention to the mildest therapeutic measures.

ERECT DISLOCATION OF THE SHOULDER

Review of the Literature and Recorded Cases with The Report of Three Cases

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WHEN the frequency of dislocations of the shoulder is considered and the number of erect dislocations of this joint reviewed, by comparison the number of the latter is indeed small and the incidence rare.

In some of the largest surgical clinics, no cases are recorded. Kronlein reports 3 cases in 207 dislocations of the shoulder. In 400 dislocations Bardenheuer met with no case. At St. Thomas, London, in 539 shoulder dislocations, no case is recorded (Makins). Treves speaks of it as a "most rare condition."

This dislocation is a variety of subglenoid dislocation and was first called attention to by Middledorpf in 1859. At that time he reported two cases and had the advantage of necropsy on one. His work was further supplemented by experiments on cadavers by his assistant, Scharm. To these men therefore belongs the credit not only of first directing the attention of the profession to this dislocation but also of first giving us the pathology. From that time up to the present the writer has been able to collect 31 cases including the 3 making the subject of this report.

In the anatomical consideration of the shoulder joint, those factors favorable to displacement are: (1) shallowness of glenoid cavity; (2) the relatively large size of the humeral head, only one-third of head being in contact with glenoid when the arm is at the side of the body; (3) the thinness and great laxity of the capsule; (4) the maintenance of the contact between the articular surfaces by muscular action together with atmospheric pressure and not by ligamentous or capsular attachment; and (5) the length of the humerus, which affords a long leverage; and the exposed position of the shoulder joint.

The foregoing conditions favor dislocation and render this joint more frequently the subject of this accident than any other joint in the body. The usual position in which luxation occurs is that of abduction and the advancement of the arm as in falls on the hand. This attitude brings the most prominent part of the lower edge of the head of the bone against the thinnest and weakest part of the capsule. Moreover the greatest diameter of the head of the humerus is involved, adding to the pressure against the capsule. As such accidents happen suddenly the muscles are taken off their guard and hence that source of protection to the joint is lacking.

Those factors unfavorable to dislocation are: (1) the exceptional relation of biceps tendon to the joint strengthening the capsule

at its upper portion; (2) the arrangement of glenoid cup, the inner and lower edges of which are more prominent than the outer and upper; (3) the deepening of the glenoid cavity by the glenoid ligament; and (4) the resistance offered by the strong coraco-acromial ligament to any upward displacement.

ETIOLOGY

The ages of the patients range from 21 to 60 years. If the patient is above 60 there is usually a fracture because of the brittleness of bone, and if younger than 20, an epiphyseal separation rather than a dislocation. For the actual production of the luxation, violent force is not necessary but when it occurs the arm is usually abducted or extended and the forearm pronated.

"Direct or violent force applied to the shoulder from above has been the determining factor in two cases" (Maurel).

The part played by the structure of the shoulder joint is interesting in revealing the pathology and is one of the chief signs. The shoulder joint is protected on all sides by bony and muscular structure, except at its lower boundary, which is weakest. The glenoid cavity is arched above by the acromian process in front externally, and behind by heavy muscles, but there is nothing below to support the head of the bone and it is easy to see why the rent occurs in this part of the capsule.

PATHOLOGY

The work done at autopsy on the few cases that succumbed, has been supplemented by work in the dissecting room. The head is always found against the side of the chest, there is a separation of the capsule from the humerus in its upper part, with the supraspinatous and infraspinatus muscles torn away. At times there has been a partial rupture of the subscapularis and pectoralis major. Injury to the axillary vessels, while it might be expected, has not occurred to any serious degree. Nerve injury, however, has been more serious and permanent.

SYMPTOMS

There are three cardinal symptoms seen in this dislocation: (1) elevation of the arm; (2) fixation in this position; and (3) pain increased by any attempt to lower it. The forearm is usually flexed and resting on the top of the head. The fixation of the arm in this position is explained by the tenseness of the anterior and posterior parts of the capsule, i.e., the part in front of and behind the rent through which the head passes. The long head of the triceps also retains the head of the bone in this position.

CASE REPORTS

It has been possible to collect 28 cases in the literature. Hulke in Holmes and Hulke's *Surgery*, mentioned two cases coming under his observation at King's College Hospital, but no details are given.

Bardenheuer in his work on "Injuries of the Upper Extremity," speaks of Bertin having a case and of Meyer having two. Here details are lacking.

Stimson (1915) mentions 3 cases admitted to the Hudson Street Hospital, one of which was seen by Stimson. He remarks that "it is probable that no one surgeon has seen more than one case."

The following cases have been reported in the literature. To these are added the 3 cases which make the subject of this report, herewith published for the first time.

CASE 1. Middledorpf (1859). F. B., driver, age 57, applied for treatment, June 10, 1857. While working in a hay loft, a plank gave way and he fell to the floor below. His arms were forced above his head. He tried to hold on to the planks but plunged heavily downward. When he landed on the floor below he found he could not lower the left arm. He entered the hospital with an expression of great pain and his left forearm resting on his head. The deltoid muscle was loosely drawn together. Under the middle of the lower margin of the pectoralis major and below the glenoid cavity was the humeral head. Without anæsthesia, several unsuccessful attempts were made, when finally it was reduced by extension in the line of deformity and then gradually describing an arc with the elbow directed upward and outward and then downward, at the same time pressure from below on the head. On June 30, the patient was discharged without any untoward symptoms.

CASE 2. Middledorpf (1859). T. S., laborer, age 27 years, March 30, 1858, was winding a load of 4,400 pounds with a windlass to an upper floor. The locking device broke, the handle turned back and drove the arm in the opposite direction violently upward and struck the humerus near the joint as it

came downward. The man when brought in was in extreme shock. The right shoulder appeared as if the humerus was broken, the bone projected upward, the elbow a little higher than the top of the head. The deltoid contained an extensive wound which became infected and the patient died. This case came to autopsy. The capsule was stripped off, the greater tuberosity was broken and hanging to the supraspinatus muscle, and all muscle insertions were torn off, except the pectoralis major and latissimus dorsi.

CASE 3. Busch (1863). X. Y., porter, age not given. The patient was going down the cellar steps carrying a heavy sack on left shoulder. In the dark he stumbled and fell. He at once experienced great pain in the left shoulder and when he arrived for treatment the left arm was lifted, the left elbow was bent, and the forearm was resting on the head, the right hand supporting the left. The head of the arm was resting in the arm pit. Several times the patient tried to pull the injured member down to his side, but the pain was so severe that he did not succeed and it would each time resume the position given above. Finally the operator placed the patient on the ground with the head bent a little to the right, in order that the arm could be bent a little toward the right away from the erect position. With a slight pull upward the arm was replaced.

CASE 4. Lange (1879). A male, age 45, was rolling ice. The arm was extended at an angle of 120 degrees with hand in supination. After reduction the patient went to work in 3 weeks.

CASE 5. Alberti (1884). W. G., driver, age 32, on April 4, 1833, as he tried to hold down a rearing horse by the reins, was carried up in the air with the arms lifted. When the horse came down to the ground it knocked him with its front foot and threw him to the ground. He at once felt pain in the left shoulder and could not bring his left arm down. On examination the left arm stood almost vertical. The forearm was flexed at right angles and the hand rested on the head. The glenoid cavity could be easily felt. The deltoid muscle showed two deep indentations. The head of the humerus was just a little posterior to the mid-axillary line. Under anæsthesia, by extension the head of the bone was pulled into the glenoid fossa and a Desault bandage applied. As the patient did not return after leaving the hospital, the ultimate result could not be ascertained.

CASE 6. Hansson (1892). P. S. N. S., age 41, female, on night of August 26, 1890, was bending forward leaning against the door frame with right arm above the head. She slipped and almost fell on her face. She felt pain in the right shoulder. The right humerus was in the erect position, the elbow on a level with the forehead and the arm at an angle of 170 degrees with axillary line. The forearm was horizontal. There was a large swelling in the axilla. Passive movement was very painful and limited. The accident had occurred 7 hours before the patient sought aid. Because of this and the fact that she was pregnant and had a goiter, she was very weak. Attempt at reduction without anæsthesia was not successful. With chloroform, the arm was pulled up and circumducted outward toward the midline of the body, at the same time exercising pressure from below. The head of the bone slipped into normal position and the arm could be moved in all directions. The arm was not immobilized. Three weeks later, there was some paralysis. Massage was used. In April, 1891, paralysis had disappeared and the patient could do ordinary duties.

CASE 7. Judd (1895). A man, age 32, in April, 1895, fell on the office floor with outstretched left hand. Without anæsthesia reduction was accomplished and in six weeks recovery was perfect.

CASE 8. Margarey (1895). Female. Left shoulder. Accident caused by patient wrestling with her husband. The hand extended above her head. Reduction was accomplished by extension with heel in the axilla.

CASE 9. Scheller (1896). A private soldier was carrying his bed on his right shoulder and had his arm lifted upward in order to keep the bed in position. In this way the head of the humerus became dislocated. The right arm was extended and immovable. The deltoid muscle was slack and could be pressed down easily. The head of the humerus could be easily felt. The patient stated that on several occasions he had suffered dislocations of the shoulder. Reduction was accomplished by strong extension in axis of the arm without any anæsthesia.

CASE 10. MacDonald (1903). A middle aged man, holding the reins of a scared horse, fell. The picture was classical. Reduction was done under anæsthesia.

CASE 11. Osenbach (1904). K. F., male, age 24, fell from scaffold and in falling extended the left arm which was struck by a piece of timber. This produced a subglenoid dislocation and because of retaining his hold, as he fell he simply pulled his arm upward, reversing the long axis of the humerus and producing a luxatio erecta. It was reduced by extension and immobilized. The patient returned to work in 10 days.

CASE 12. Vaughan (1904). A man, age 66 years, was admitted to the hospital October 4, 1903, after a carriage accident. The elbow was in 45 degrees abduction, the forearm was flexed. Reduction was accomplished without anæsthesia. One month later the result was good save for wrist drop.

CASE 14. Montgomery (1905). A man, age 64, September, 1904, fell and in an attempt to save himself, stuck out the right hand. Reduction with ether was accomplished 2 days later. Ten week later, there was wasting of the deltoid and no power to grip. Extension of the fingers was almost nil. Pronation was fair. Supination was restricted. Of interest in this case is the brachial plexus injury.

CASE 15. Edson (1908). N. J., male, age 42, while hastening to catch a trolley car, slipped and fell, and sustained a fracture of the neck of the femur

and upward dislocation of the shoulder. Reduction was made under chloroform. The patient had fair use of his arm.

CASE 16. Gregoire (Prost) 1909. A man 35 years of age, a painter, fell from the top of his ladder and lighted on his hands. The left arm was in the characteristic position. There was pain on attempt to lower the arm. Roentgenography confirmed the clinical picture and diagnosis. Reduction was easy.

CASE 17. Preston (1910). The patient was struck by a train and the method of production was difficult to ascertain. Reduction was accomplished by extension and pressure on head of bone. The patient died in 2 days because of other injuries.

CASE 18. Falkner (1916). An elderly miner walking along the railroad, fell in a ditch, dislocating the shoulder. When first seen the day after the injury, the patient had an ordinary subcoracoid dislocation with considerable ecchymosis in the axilla. Under chloroform he was unable to reduce the dislocation. A companion of the patient ventured the information that when the accident first happened the arm was extended over the head, and he had great difficulty in getting it down. Under ether anæsthesia, at a second attempt, reduction could not be accomplished by usual methods. The head of the bone was on the edge of the glenoid cavity. The arm was then fully extended above the head into the position that it was immediately following the injury. Traction was made upward and rather forward with counter pressure on the head of the humerus, which was plainly felt in the axilla, and the dislocation was reduced. Falkner believes this to have been a case of luxatio erecta.

CASE 19. Tixier (Maurel) 1919. A butcher in falling down the steps got his arm above his head and was afterward found to have an erect dislocation. The details of this case are very limited.

CASE 20. Maurard (1920). This is the only case of double luxatio erecta thus far recorded. The patient was a man 30 years old, an aviation pilot. He was sent to the hospital June 11, 1920. The machine fell to the ground shortly after starting. On admission to the hospital, the patient was in great pain. The arms were raised on each side of the head in a position representing a "prophet in prayer." The arms had a tendency to fall backward which provoked a great amount of pain. The position was symmetrical but pain was greater on the left side. On the right side color was normal but the pulse could not be felt. At the bottom of the arm pit there was a round hard projection which was the humeral head. Passive motion of the arm brought about great pain. On the left side signs were identical, but under the arm pit there was a clot and it was impossible to move the fingers or the limb. X-ray examination confirmed the diagnosis. The general condition of the patient was bad; he was badly shocked. Reduction was made with a small amount of ethylchloride. The patient died an hour after reduction. Autopsy. Right shoulder: The capsule at its lower part contains a rupture. In placing the limb back in the position of dislocation, the head of the bone is exposed and the articular surface is lying forward and the vessels and nerves are lifted up in the same way "as the reins of a toy horse." The vessels and nerves are intact. Left shoulder: In accentuating the motion of the left arm, the head goes entirely out of the capsule. The tuberosity of the humerus is found to be fractured. The muscles over and under the scapula are fully detached. On the left side the lesions are exactly the same.

I would report the following cases.

CASE 21. (1914). H. R., male, age 62 years, entered the hospital complaining of an injured shoulder. The injury was sustained at the factory in a fall over a truck when the right arm and shoulder were twisted. The following note was made on admission: Pain is excruciating and no movement is permitted. Patient says he cannot move arm to side and that this is the first time he has had any severe sickness or injury. He felt perfectly well until injury was sustained. On entrance patient seems in great pain and discomfort. Right arm is held up at an obtuse angle from body (Fig. 1)[1]. with forearm extended. Movement produces great pain. There is considerable deformity and quite a fold at the normal position of head of humerus, the head being below and anterior to the glenoid cavity. No crepitus is elicited. Examination is otherwise negative.

Impression: Subglenoid dislocation of the humerus of the erect type. The X-ray shows a marked subglenoid dislocation with no fracture. Without ether, reduction was attempted but was unsuccessful Under ether anæsthesia the dislocation was reduced by traction upward and the arm was immobilized with a crinoline bandage.

Nine years after the injury the patient is well and has very good use of right shoulder. There is no nerve injury. Motions are good in all directions. He has had no further trouble in this shoulder.

CASE 22. (1921). S. P., male, age 21 years, was in a motor cycle accident a short time before admission. When he came in his right upper extremity was projecting upward, parallel with the side of the head. There was a moderate amount of pain but any attempt to bring the arm down greatly increased the pain. The head of the humerus could be felt below the glenoid cavity. The X-ray confirmed the diagnosis of subglenoid (erect) dislocation of the shoulder (Fig. 2). Without an anæsthetic, by slow, gradual traction upward, the head was felt to slip in the glenoid cavity and the patient was able to move the shoulder joint. The member was immobilized for 2 weeks and the patient's recovery was complete, with no nerve injury.

CASE 23. (1924). P. R., male, age 28 years. While playing baseball and running for bases, tripped and

[1]This is the original of the X-ray shown by Baetjer and Waters in their work on "Bones and Joints."

Fig. 1. H. R. January 9, 1924. Male, age 62.

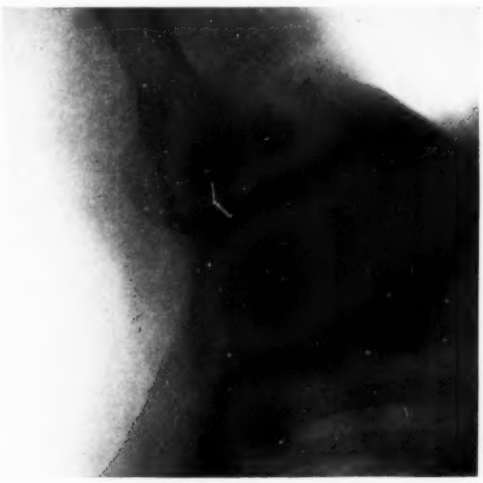

Fig. 2. S. P. July 4, 1921, Male, age 21.

slid with right upper extremity projecting forward and abducted. He suddenly experienced pain in right shoulder and when picked up was unable to lower right arm to side of chest. When I saw him the right arm extended upward parallel with side of neck and head, the right forearm was flexed at elbow and the hand was supported by the left. Any attempt to lower the right upper extremity increased the pain. The head of the humerus was found below the glenoid cavity. The case was at once recognized as an erect dislocation of the shoulder. Under brief gas anæsthesia by upward traction of the right arm and forearm and with an assistant pressing on head of humerus in axillary space, the dislocation was easily reduced. Subsequent X-ray examinations showed a slight tearing away of greater tuberosity of the humerus. At the present time patient is still wearing an immobilization dressing because of the complicating fracture.

CONCLUSIONS

Violent force is not always necessary to produce this form of dislocation. The position of the arm in a large measure influences its occurrence. There is considerable damage to the capsular ligament and to the muscles attached to the upper end of the humerus in all cases. Occasionally we meet with nerve injuries. Reduction by upward traction of the arm has been easy in the majority of cases. Reduction by the ordinary means has usually been unsuccessful. Naturally, the occurrence is more common in males. Between the right and left shoulder, the number is about evenly divided. There is only one recorded bilateral case, that of Murard (1920).

The writer feels that the rarity of the condition justifies the reporting of these cases.

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FRACTURE OF THE MIDDLE THIRD OF THE CLAVICLE

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ALL writers agree that fractures of the middle third of the clavicle are rarer than those of the intermediary third or the junction of the middle and outer thirds. Of the 134 cases of fracture reported by Hamilton, only four involved the middle segment. Gurlt, quoted by Ricard, in 221 cases found only 6 fractures of the middle third. Whereas Delens met with 8 cases of fracture of the middle third, and collected 20 others from various writings. I have been unable to trace any systematic work on the subject, and have found only brief mention of the subject in treatises on surgical pathology or in monographs devoted to fractures. I do not know whether this is due to the rarity of such cases, to the fact that many such cases do not come within the range of hospital statistics, or to the scant importance attached to these fractures by modern writers. Neither Garré and Borchard (third edition, 1921) nor de Quervain (sixth edition, 1919) mention this important phase of traumatology.

I will refer briefly to two cases of fracture of the middle third of the clavicle which I have recently had occasion to observe in the male surgical division of the Civil Hospital in Padua. The first was an almost complete fracture in a child of 6 years, which came under our observation about 20 days after the lesion. The second was a complete fracture in a man of 72 years.

Case 1. A boy, age 6, on April 2, 1923, while playing in the courtyard, fell, striking the tip of the right shoulder against the ground. After crying for a few minutes he went on playing, moving the upper right joint as if nothing had happened. A few days later the mother noticed that although the child did not complain of any inconvenience he nevertheless held the tip of the right shoulder slightly lowered. Twenty days after the fall, without further lesion or exertion, while playing the child complained of pain in the vicinity of the middle third of the right clavicle, and it was only then that the mother noticed a swelling. On the same day the patient was brought to our section to be examined.

Heredity, negative; no previous fracture; the child appears healthy; cranium rather large in proportion to age. Thorax and abdomen negative. The right clavicle in its medial part (Fig. 1) showed a fusiform tumefaction the size of a pigeon's egg. This swelling was pretty close to the sternoclavicular articulation, becoming gradually smaller toward the lateral segment of the bone which was normal in aspect. The tip of the right shoulder was on the same level as that of the left, but protruded slightly forward. The skin covering the tumefaction was of normal color and appearance and moved perfectly over the osseous surface beneath. There was no trace of progressive ecchymosis or of vein-tracery. No circulatory or nervous changes were encountered in the right shoulder joint, the active and passive movements of which were normal. The movement of the head was also free. The measurement of the bone, from the two articular space-lines (sternoclavicular and acromioclavicular) showed, on the right, a shortening of about 1 centimeter. On handling, a mass of bony substance, uniformly compact, smooth, without the least trace of channelling, was felt. The point of the finger, when inserted in the sternoclavicular articular space, penetrated slightly, a sure sign of a slight diastasis of the two joint heads. Active and passive movements of the clavicle were accompanied by movement of the intumescence. When we placed the hand on the line of the fracture, after getting the patient to move his right joint up and down, we did not notice any unnatural crepitation or mobility. But mobility was noticeable, though it was hard to detect, when we took hold of the bony heads with the fingers on either side of the line of fracture and moved the heads backward and forward. Pressure exerted along the main axis of the clavicle caused no pain except when the fingers passed over the swollen part. The tuberculin test was negative. We did not think fit to apply the Wassermann reaction. The roentgenographic examination, made 33 days after the lesion by Dr. P. Perona, showed the following:

In the middle part of the middle third of the right clavicle (Fig. 2), or just outside the appendage of the clavicular rib ligament, is a line of fracture visible especially toward the lower margin of the clavicle itself. This line, a little oblique at the axis of the bone, running from top to bottom and from the inside toward the outside, follows exactly the direction of the upper margin of the third rib below, and is partly merged with it. The two extremities, in the projection from front to back, appear as coinciding and in the same direction as the axis of the clavicle. Further, around the point of fracture, can be seen a very minute halo, scarcely recognizable when confronted with the homologous part, and constituting the bony callus (the *cal soufflé* of the French writers). The diameter of the two extrem-

ities appears slightly increased. Roentgenologically, it is also seen that the sternal extremity of the clavicle, slightly lowered, is a little detached from the "incisuræ claviculares" of the sternum.

An oblique projection as advised by Matti was not made as no dislocation was suspected, and because the line of the fracture was somewhat lateralized. On the negative the callus clearly appeared while the line of fracture was less evident; in the positive, on the other hand, the line of fracture strikes the eye clearly, but the callus is almost invisible.

Operation was advised to remove the callus and carry out suture of the ends, and also to complete the clinical diagnosis so as to avoid the possibility of a neoplastic process. On May 18, 48 days after the lesion, an operation was performed by Professor Vigliani. Ether anæsthesia was used. An incision of about 10 centimeters was made parallel to the axis of the bone in the soft tissues of the region, and the middle third of the clavicle was exposed. At the point which corresponds above with the clavicular binding of the sternocleidomastoid, a line of fracture penetrated into the thickness of the bone, leaving only a very small part unaffected; the periosteum of the posterior face was untouched. The point of fracture was convex and pointing forward; the periosteum of the anterior face was completely interrupted; laterally it was considerably torn away; the jagged edges of the ends of the fractured bone were partly locked together; and all around was an osteoid tissue, partly calcified. In order to gain a better view of the focus of fracture, an incision was made upward in the tendon attaching fibers of the sternocleidomastoid, and downward in those of the great pectoral muscle. In this way the posterior face of the clavicle was freed and kept up by passing beneath it first a stout pad of gauze and then an isolator of periosteum curved and fairly wide. After isolating by means of small pads the periosteum of each of the two ends, a cone of bone was removed together with the callus. After the two ends had been aligned the osteosynthesis was performed with an aluminum-coated bronze wire. The wound was closed in layers and healed by first intention. The course was apyretic. The child was discharged on May 27 with immobilizing apparatus to keep the arm in abduction.

In the examination 20 days after the lesion, with the sole aid of the roentgenograph, we had formed an approximate diagnosis. Clinically there existed signs of a fracture (unnatural mobility of the ends), but we had to ask ourselves whether all that could be seen and felt around the line of fracture was due (1) to exuberant callus, or contrary to all probability, (2) to a tumor of the clavicle with spontaneous fracture (medullary or periosteal sarcoma), or whether, lastly, (3) to a neoformation implanted on the callus of fracture. This could be determined only by the X-rays or by an exploratory incision.

From the anamnesis, we had to exclude not only the direct lesion, but also in all probability, a fracture by muscular traction. Apart from the fact that in children, the muscles are not very strong, the line of discontinuity in the said fractures by traction should be turned upward rather than forward. In the child the middle third of the clavicle, flattened from front to rear, presents for consideration an anterior face and an upper margin, to which the sternomastoid muscle is attached.

All surgeons do not agree as to which muscles may determine by traction the fracture of the clavicle in its middle third.

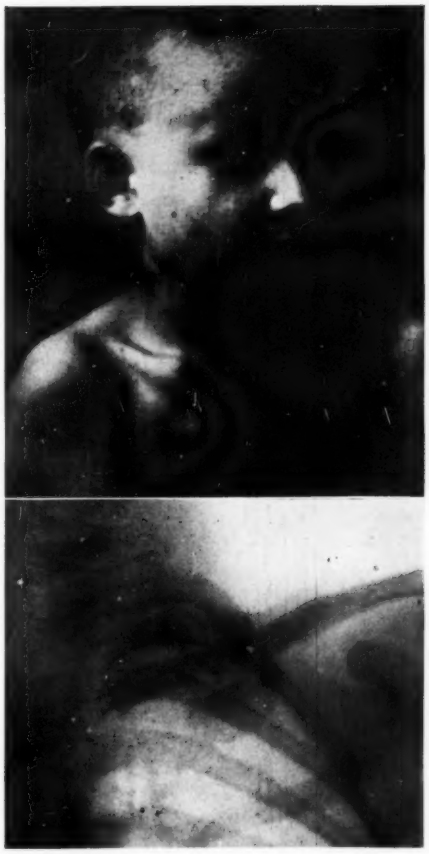

Fig. 1 (above). Case 1. The right clavicle showing a fusiform swelling the size of a pigeon's egg.

Fig. 2. Case 1. Roentgenogram showing the line of fracture, visible especially toward the lower margin of the clavicle.

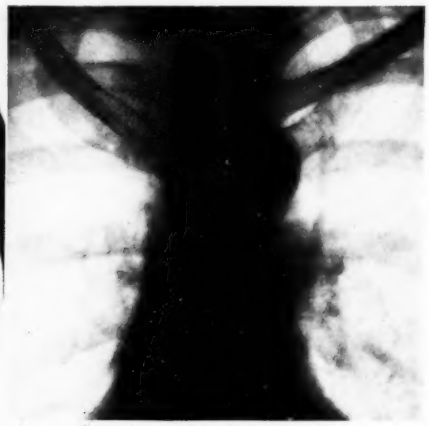

Fig. 3 (left). Case 2. Fracture of third medial of right clavicle, with tumefaction at the sternoclavicular articulation.

Fig. 4. Case 2. The line of fracture is irregular and jagged, especially toward the lateral head.

According to the opinion of Delens, recently of Eisendrath, and many others, the only muscle to which the fracture of the middle third of the clavicle may be ascribed is the sternomastoid. On the other hand, according to an accurate study made by Pollaillon (quoted by Keith and MacKenzie), "in no case does the fracture appear to have been produced by the sternomastoid muscle," and the only muscles which can determine it are the deltoid and the clavicular portion of the great pectoral. A grave blow has also been dealt by Pfanner to another mechanism thought out especially by German authors to explain the fracture of the middle third of the clavicle. I refer to the so-called "Hipomochlion fracture." Apart from the fact that in my case the line of fracture ought to be turned upward (this because to bring about the fracture the clavicle must be forced violently onto the first rib and the pressure must be exerted from top to bottom), Pfanner asserts that even when this condition is verified a fracture of the clavicle in all probability would not ensue, but rather a dislocation of the breast clavicle joint either upward or forward. These three modes of fracture being thus excluded, principally on account of the anamnesis and the reasons mentioned, it only remained to consider the indirect blow, indicated by the anamnesis. In fact, the child, in falling, struck the tip of the shoulder on the ground. Also the diastasis of the joint heads was noted clinically, and demonstrated roentgenographically. This was the result doubtless of the force exerted on the sternoclavicular articulation. In the study of the focus of fracture, we must above all take into account the lack of adhesion of the ends 46 days after the lesion. Ollier has shown that the constant mobility of a fracture, even when exerted within narrow limits, prevents the ossification of the tissues of the callus, so that this remains in the fibrous state. In our case, after the lesion, the ends had not been fixed in a retention apparatus, and despite the fact that the bone on its rear face had not been injured in its continuity, the movements made by the child when playing might have been sufficient to prevent the fusion of the ends, thus explaining the persistence of the line of fracture at such a remarkable distance from the lesion.

In explaining the exuberant callus, we could readily eliminate displacement of the ends, large hæmatoma, fracture combined with violent contusion of the soft parts, and the irritating action of massage (Matti and Lexer). The exuberant callus in our case must have resulted from the irritation produced by the movements of the joint, and from the remarkable separation of the periosteum noted on

the operating table. The general rule which proves that the smoother the surface of a bone, the less the periosteum adheres to it may be applied also to the clavicle, in which, according to Piersol, at the same age, the adhesion of the periosteum to the bone is considerably less than the adhesion of other parts of the bone structure. Finally we must take into account the periosteal density associated with precocious ossification. As a matter of fact the clavicle is the first organ of the bone structure to become ossified after the first month of fetal life and the ossification develops rapidly (Chiarugi). In conclusion, in our opinion, the cause of the exuberant callus was to be found in the special structure of the periosteum, and in its relations to the bone. Nor can we exclude the fact that the formation of such a callus might have been related to the signs of rickets noted in the patient as the excessive size of the head in proportion to the age. According to Ombrédanne the periosteum of children with rickets is still thicker and adheres still less than in the case of normal children.

Further, the structure of the exuberant callus cannot be dissociated from the mechanism of cure of fractures. As regards this point there are two conflicting theories. According to Bonome, the callus is formed of trabeculæ, at first osteoid, which subsequently become osseous, mature, and calcified. After the eighth or ninth week, the callus solidifies by the absorption of calcareous salts; subsequently the so-called involution takes place: the trabeculæ become smaller and the callus more compact and solid. The second theory, launched by Wolff, has found a strenuous defender in Italy in Dalla Vedova, of Rome. According to Wolff's ideas, in the cure of fractures there are two distinct processes which have nothing in common. At the beginning there is a reactive process or fusion which forms the scar known as a callus. This is formed of bony porous tissue, which subsequently entirely disappears to be replaced by normal bony tissue. If I were asked by the formulators of the law of transformation according to Wolff whether in my case the callus was a product of reaction or of transformation I should not be able to reply with certainty. I believe, however, that we were in the presence of the so-called product of reaction; and I regret not having made a histological examination of the fragments of bone removed. In our research work we should always bear in mind the warning of Van Gehuchtem that with man the experimental method is always more lengthy and laborious because we have to wait until nature produces the desired lesion, produces it within the limits required, and produces it and nothing else, and this is only to be found in extremely rare cases.

TREATMENT

I shall certainly not enumerate the 85 methods collected up to 1921 by Béla V. Mezö, all of which are called treatment of fractures of the clavicle because for the most part they deal with fractures at the typical spot, i.e., the intermediary third. Our operation had for its object both diagnosis and cure. We desired to establish the true nature of the intumescence and to proceed accordingly; to remove the exuberant callus or to suppress the clavicle immediately should we find ourselves in the presence of a real tumor. Surgical action to correct the position of fragments in the fracture of the clavicle is of fairly ancient origin, and, defended by Dalla Croce, dates back more than three centuries.

In his compendium of Italian surgery, Giordano quotes Dalla Croce à propos of the fracture of the clavicle: "Concerning the prognosis it should be known that the cure of such a fracture is, in the opinion of all men, difficult. And it needs an ingenious and skilled man. Since it is usual in these fractures for the bone to splinter, setting up a painful and persistent pang, it is necessary to cut, so that the bone may be freed of pieces and splinters; but with great care, however, so that the fleshy parts of the breast may not be injured." Giordano is likewise of the opinion that immediate action is necessary in subcutaneous fractures of the clavicle. He exposes the focus in order to suture the two bony ends. In our case we deemed it sufficient to remove the callus, following this up with simple metallic suture without complicating it by the method very recently advocated by Hinze, which consists of wrapping each bony end spirally and

then passing the wire by the subperiosteal route underneath the first rib, or, in exceptional cases, underneath the second, in order to prevent the ends reassuming the angular position.

We saw our patient again 3 months after the operation, and are convinced that we attained our object both anatomically and functionally, thus confirming the principle of Catterina that the ideal cure for all subcutaneous fractures of the clavicle is the surgical one, which results in perfect reduction and retention.

CASE 2. A man, age 71, mason, of Piazzola, gave a negative family history. In 1918 he suffered for about 8 months from acute articular rheumatism, of which he was completely cured after thermal treatment (Abano). On July 23, 1923, while he was working on the paving of a room he put his foot on one of the flagstones which gave way and caused him to fall to the ground from a height of about two and a half meters, striking the right shoulder tip on the ground. He was admitted to our section 2 days later. He had not suffered from previous fractures nor from rickets.

He appears healthy but slightly kyphotic. There are impurities of the tones of the heart and enlargement of the cardiac area, also bronchial catarrh mixed with pulmonary emphysema. An inspection of the region affected by the lesion reveals (Fig. 3) a tumefaction coinciding with the right sterno-clavicular articulation. There is no trace of ecchymosis. The end detached from the clavicle protrudes slightly under the skin. The right shoulder is somewhat higher than the left, and appears nearer to the middle line. The right clavicle seems to point obliquely from front to back, toward the outside and downward. The approximation of the tip of the right shoulder is still more evident when the patient is observed from behind. The head is maintained on the middle line. On turning the head toward the right the patient feels more pain than when he turns it to the left. The corresponding joint is in normal position. Raising the right arm also occasions pain, though the patient is able with some difficulty to place the right hand on the top of his head. The left clavicle measures 19 centimeters in length, the right, 15. On probing, the sternal extremity of the right clavicle is felt to be in position; the articular space is probed with the nail which penetrates while the lateral is lowered; the ends appear parallel, the proximal above, the detached below. The entire supraclavicular region is painful. Pressure exerted along the main axis of the bone does not occasion much pain. The exploration of the clavicle from the outside inward, with the two hands respectively above and below, causes pain in the swollen area. There is no trace of vascular or nervous lesion in the right arm.

The roentgenological examination (Fig. 4) reveals the following: The clavicle presents a complete fracture in its middle third. The line of fracture is rather irregular and jagged, especially toward the lateral head, which also shows for a length of about 1 centimeter, a fissure parallel to the major axis of the bone, dividing it almost in half. The lateral end points distinctly inward and downward, so as to leave the medial end completely visible, this latter being in position while its shadow may escape notice as it merges a little with the posterior shadow of a rib. The medial end shows a direction symmetrical with that of the corresponding part on the other side.

The fracture was reduced and the shoulder fixed in a retention apparatus.

It is truly stated in all treatises that the function of the clavicle is to keep the shoulder away from the trunk (the "flying buttress" of the French authors). Therefore when the clavicle is fractured, the shoulder approaches the trunk, and since the clavicle resists the fall of the shoulder, drops downward and forward. It should be remarked that this is true only for fractures of the intermediary third. On the other hand, as can be clearly seen in the roentgenogram in fractures of the middle third, when the lateral end penetrates underneath the medial, the shoulder is accordingly forced upward while protruding forward and nearer to the middle line.

A case of complete fracture from an indirect cause, as the first case, makes an interesting study as to the displacement of the ends. With regard to this the opinions of authors are somewhat divergent. Tillmanns is of the opinion that either dislocation is completely absent or that the external fragment is forced up by the weight of the shoulder only when the muscular insertions are torn away and the costoclavicular ligament lacerated.

According to Eden, a marked displacement of the extremities of fractures is not generally found, because the costoclavicular ligament and the sternomastoid muscle almost balance each other in their action. Forgue refers to two anatomical exhibits seen in the Dupuytren museum in which the external fragment protruded downward and forward under the sternal fork. Tanton is of the opinion that the external end is carried forward and downward while the internal fragment is drawn up by the sternomastoid; this displacement repro-

duces that of the third intermediary. Koenig believes that displacement may be entirely absent, or the internal fragment may remain in position, while the external is carried forward and upward. Occhini and Catterina think that displacement exists only when there is laceration of the posterior intraclavicular ligament. Rose-Carless and Matti consider that the displacement varies with the line of fracture; when oblique, the lateral fragment is carried down and forward. This is also the opinion of Malgaigne (quoted by Ricard).

In conclusion, if we admit the integrity of the costoclavicular ligament, I think that the medial fragment, as was observed by us, remains completely in position, and that in the event of the line of fracture being external to it, the lateral fragment would be carried forward and downward.

In this second case we did not think fit to operate, not so much on account of the age of the patient as on account of his general condition. We therefore limited ourselves to reducing the fracture and fixing it in a retention apparatus. We ought always to consider the possibility of a sternoclavicular arthritis, even if the rim of the fracture has not penetrated into the articulation. We should consider the predisposition of the patient to such a diseased condition, and also the repercussion suffered by the joint at the moment of the lesion. It may be that this arthritic process may greatly limit the function of the joint.

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INTRA-ABDOMINAL BILIARY EXCLUSION FROM THE INTESTINES—CHOLECYST-NEPHROSTOMY, A NEW METHOD

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SINCE 1844, when Schwann made use of an external fistula for studying bile, many methods for a similar purpose have been devised. Each of these has had some particular drawback which has led to the devising of still other means for the exclusion of bile from the intestines.

The physiology of the bile and its relation to the various metabolic functions of the body has recently acquired renewed interest because of the work of Hooper and Whipple, Rous and McMaster, and others. In attempting to study the important question as to whether or not bile is essential to life, the physiologist has been confronted with the difficulty of finding some method that would not require too great inconvenience in the dressings of the fistula and would not need elaborate collecting apparatus. Lastly and most important of all, the possibility of infection of the biliary passages has always been present.

The simple external biliary fistula first made use of by Bidder and Schmidt (1) is one which at most can be used only for a very short period because of the severe infection produced. The animals must be dressed daily, the fistula must be frequently dilated as Hooper and Whipple (6) described, and unless the dogs are strapped up all the time they will lick off a certain amount of bile. The rôle that the imbibition of this small amount of bile may play is not yet ascertained with surety.

Dastre (2) described a method in which he kept a tube in the fistula for more than a year, collecting the bile in a bag suspended at the neck. However, no references could be found of any other investigator who had made use of this method.

Pawlow (3) transplanted to the skin a flap of the duodenum containing the ampulla of Vater. Mann (7) has recently described a two-stage operation whereby the duodenum containing the common duct is transplanted through an abdominal incision into the subcutaneous layers and the duct later directly connected to the body surface. All of these methods have practically the same objectionable features as the common biliary fistula.

Rous and McMaster (4) have made use fo another method. A long tube is attached to a cannula inserted into the common duct. The gall bladder is excluded from the biliary system by ligation of the cystic duct and the bile collected daily in a sterile balloon. They suggest that this method can be utilized for the collection of bile "during months certainly and probably during years." But in spite of this they state that their dogs sooner or later became infected. However, when an investigation involves the determination of the biliary output these methods are necessary. They are essentially extra-abdominal.

Pearce and Eisenbrey (5) have suggested a different type of approach. After removing the right kidney, they anastomosed the common duct to the right ureter. In this way bile was diverted through the urinary tract. Several successful operations were reported, but the fact was emphasized that the operation was difficult and the danger of rupture of the anastomosis or cicatricial obstruction great.

The method described in this paper does not allow for direct studies of the biliary output but provides a means whereby bile may be excluded from the intestinal tract for a long period of time without incurring any of the difficulties mentioned previously.

METHOD

The principles involved are (1) the anastomosis of the gall bladder to the pelvis of the right kidney and (2) the ligation and division of the common duct. Both procedures can be performed at once or in separate

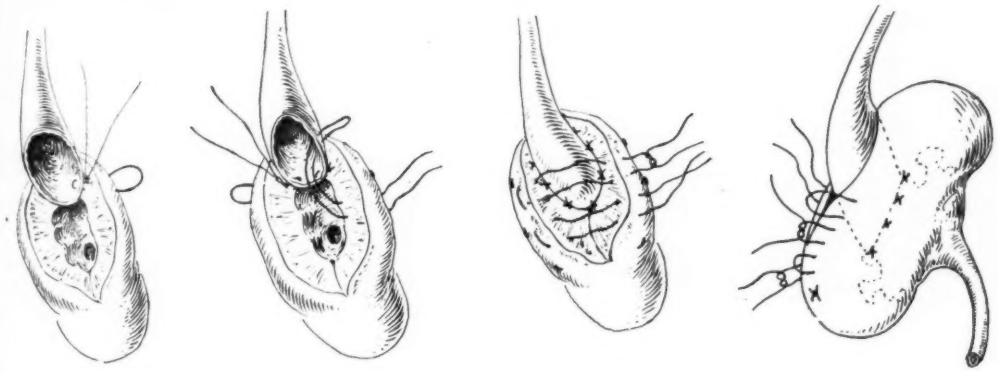

Fig. 1. Fig. 2. Fig. 3 Fig. 4

Figs. 1, 2, 3, and 4. Diagrams showing suture of gall bladder into kidney pelvis.

stages as one sees fit. We have used both methods. The operation is performed as follows:

First stage. The animal is prepared in the usual manner. A right rectus incision is made from the costal margin to the umbilicus, through which the gall bladder is easily exposed. A clamp is placed upon the fundus and the gall bladder then stripped away from the liver up to about 1 centimeter from the junction of the cystic with the hepatic duct.

The right kidney is then freed from its bed, transperitoneally, and the pedicle exposed. A long curved intestinal clamp, with its blades protected by rubber tubing is applied to the pedicle just tightly enough to prevent excessive bleeding when the kidney is incised. A longitudinal incision is made extending through the cortex of the kidney down to the pelvis. After the ureteral orifice has been demonstrated, the gall bladder and kidney are placed in juxtaposition. At the most dependent portion of the gall bladder an opening 1.5 to 2.0 centimeters in diameter is made.

The circumference of this is sutured into the pelvis of the kidney by a series of mattress sutures through the entire thickness of the kidney as demonstrated in Figures 1, 2, and 3. In some cases we have found it of advantage to cut off the pryamid, thus giving a wider antrum for biliary drainage. The kidney finally atrophies in any event and the excision of this tissue in no way affects the ultimate function.

The incision in the cortex is closed by either interrupted mattress or continuous sutures. Except for the escape of venous blood after incising the kidney there is surprisingly little bleeding. The abdominal wall is closed in layers and a subcuticular stitch is used in the skin. The wound is covered with a collodion dressing.

Second stage. The second stage consists in isolating and ligating the common duct. A portion about 1.5 centimeters in length is excised. The approach and closure are as in the first stage.

If both stages are to be done at once, we have found that the procedure is simplified if

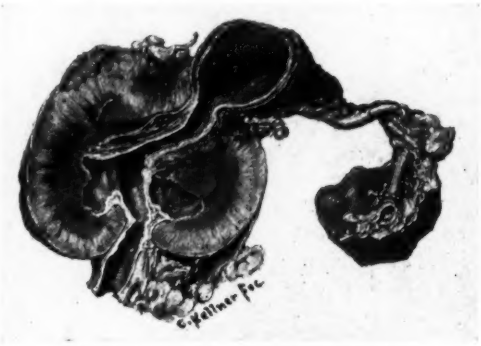

Fig. 5. Sagittal section of anastomosis.

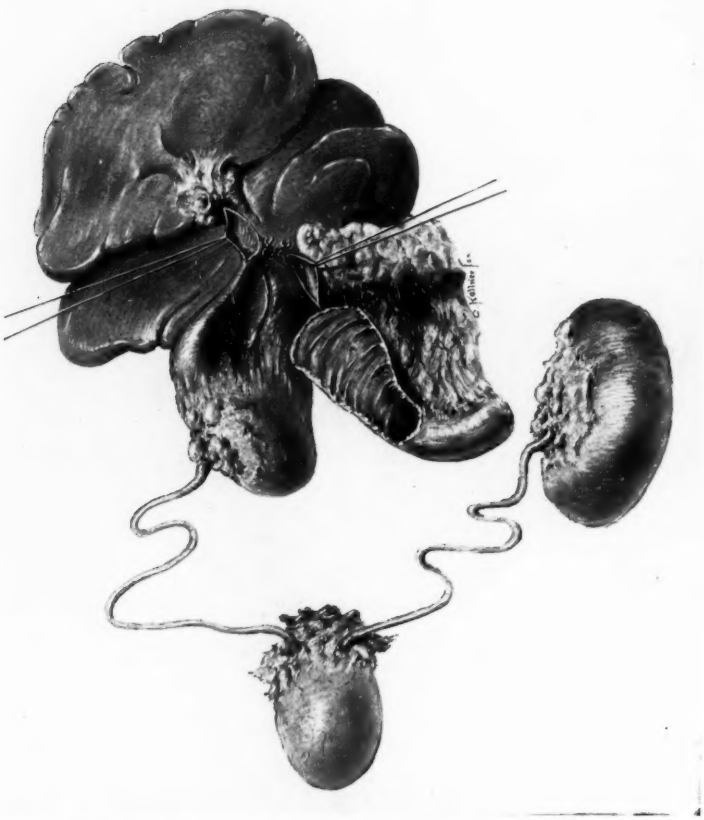

Fig. 6. Gross specimen of complete anastomosis. No hydrohepatosis.

the common duct is ligated and severed before making the anastomosis.

RESULTS

Immediately after the first stage, bile can be found in the urine in varying amounts but the animals remain at practically the preoperative weight. The appetite is unimpaired and they soon recover from the effects of the operation. The cholecyst-nephrostomy is covered by a thin layer of adhesions which soon forms a capsule. The right kidney atrophies and appears like a diminutive hydronephrotic kidney, with only a shell of renal tissue present. If the gall bladder is completely detached from the liver surface, there may be some obstruction at its neck with subsequent dilatation of the hepatic ducts. The left kidney in the meanwhile hypertrophies markedly.

Following the second stage, the animals have been kept either for starvation or feeding experiments, the results of which will be reported later.

In these dogs, we have found that periodic catheterizations reveal clear and uninfected urine. The stools have been clay colored and free from bile pigment. Cross section and microscopic study of the urinary bladder, the anastomosed kidney, and the liver have showed no evidence of infection. No communicating channels were found between the

Fig. 7. Photomicrograph of anastomosis. Note absence of infection. *1*, Kidney; *2*, gall bladder.

Fig. 8. Photomicrograph of anastomosis. Note absence of infection. *1*, Kidney; *2*, gall bladder.

severed common duct and duodenum and the intestines were free from bile.

SUMMARY

A new method of intra-abdominal drainage of bile by a cholecyst-nephrostomy with consequent exclusion of bile from the intestines has been devised for the purpose of studying its relations to metabolism. The method does not allow for determinations of the total biliary output but pigment studies can be made. It insures a biliary fistula free from infection and necessitating none of the inconveniences of dressings or collecting apparatus.

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HEPATITIS, A CONDITION ASSOCIATED WITH GALL-BLADDER DISEASE[1]

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THE finding of varying degrees and various types of hepatitis at autopsy has been of such frequent occurrence that pathologists have accepted this finding as a commonplace of postmortem examinations.

Hepatitis, using the word per se and distinct from either Laennec's or Hanot's cirrhosis, is casually mentioned by one reference only in Moynihan's *Gallstones and Their Surgical Treatment* under the head of hepatitis sequestrans and refers to hepatic slough incident to empyema of the gall bladder. Hepatitis is mentioned twice by Osler in his *Practice of Medicine*, once under the head of interstitial cirrhosis referring to Laennec's cirrhosis and again under the head suppurative hepatitis referring to abscess.

It will, therefore, be noted that hepatitis as a pathological or clinical entity in connection with abdominal disease has received but scant notice. Pathologically it has received more extended notice but without any clinical data for interstitial hepatitis is found repeatedly in postmortem examinations without the presence of such condition being noted during life and without the presence of any symptoms pointing to its existence.

Reidel in 1881 thought that the linguiform process of the right lobe of the liver depended upon disease of the gall bladder such as inflammation, stones, distention or traction through pericholecystitic adhesions.

It is more than probable that in minor degrees of hepatitis there are no symptoms, as the liver possesses marked regenerating power and in any destructive lesion of the liver there are varying degrees of regeneration in the form of compensatory hyperplasia. This is particularly evidenced in sections from the liver in portal cirrhosis where there is a marked hyperplasia of bile radicles, which in some cases reaches an extraordinary development.

Following the standardization of technical procedures directed against diseases of the biliary apparatus, surgeons have been noting a variety of gross and macroscopic changes in the liver coincident with diseases of the external biliary apparatus. These hepatic changes have varied from minute pinpoint areas of fibrosis to gross enlargement of the liver with fibrous tissue replacement, with irregularity of the surface and changes in the consistency of liver substance.

Our interest in hepatic changes accompanying or sequential to gall-bladder disease was stimulated to a very great extent by a report by Stockton and the very excellent papers of Graham and Peterman. Graham was able to prove that in every one of his operative cases of cholecystitis, there was the indubitable presence of a hepatitis upon pathological section of pieces of liver removed. In the last few years we have been particularly interested in (1) the macroscopic changes in the liver in the presence of undoubted disease of the biliary apparatus; (2) the histological examination of portions of excised liver and the determination of the degree of degeneration of hepatic tissue, the amount of fibrous tissue replacement and whether the predominant change was associated with the portal veins or with the bile radicles; (3) whether the cases presenting macroscopic and microscopic evidence of liver changes would show any deviation in their blood chemistry that might be interpreted as suggesting a liver deficiency or liver dysfunction; (4) and further, whether there did not exist in varying degrees a clinical state as the result of deficiency of liver function. Our surgical procedures have assumed, therefore, a more thorough investigation of the liver during the course of abdominal operations; the removal of portions of liver tissue for examination; a pre-operative and post-operative test for liver function, particularly the application of the alimentary leucocytosis or the so-called hæmoclastic crisis of Widal; in addition to these, the determination of rest

[1] Read before the American Gastro-Enterological Association, April 30, 1923, Atlantic City, New Jersey.

nitrogen both before and after operation and disturbances in the relationship of the nitrogen balance. The purpose of our paper is to record the frequency with which a histological hepatitis exists in the presence of disease of the external biliary apparatus.

The association of hepatitis with disease of the gall bladder or with disease of the small intestine, cæcum, and ascending colon, is usually revealed by some increase in the size of the right lobe of the liver. It has not been an infrequent finding to discover a typical Reidel's lobe extending down to the crest of the ilium, and it is interesting to note that when there is an enlargement of the right lobe of the liver it is usually in the posterior half that the greatest enlargement exists. The enlargement manifests itself from slight to considerable. On an average the right lobe of the liver will be enlarged from 3 to 5 centimeters below the costal margin in the anterior mammary line.

It is interesting to recall that Silvestri and others attempted to segregate liver function in regard to the right and left lobes of the liver. It has been a frequent observation that when the liver is enlarged in diabetes the right lobe is affected, while in Banti's disease and other splenomegaliæ it has been observed that the left lobe participates more particularly. The work of Glenard and Serege lend emphasis to this contention, for in their experiments the left lobe of the liver was intimately connected with the stomach and spleen while the right exhibited more definite relationships with the pancreas and small intestine. The injection of staining fluids into the spleen invariably produced discoloration of the liver limited to the left lobe while injections into the superior mesenteric veins, as a rule, stained the right lobe of the liver more than the left.

The color of the liver in cases of chronic cholecystitis has differed from that of the normal color. Although we have placed very little significance on the color itself continuous observation seems to impress the fact that it is of a more yellowish color than the normal color of the liver.

The consistency of the liver as manifested in removing sections and its ability to withstand traction has been noted many times. The absence of friability under manipulation has been accepted as due to an increase of fibrous tissue elements in the substance of the liver. The edge of the liver instead of being smooth shows indentures and crenations.

The surface of the liver not infrequently presents an uneven, granulated appearance without the smooth, glistening surface of the normal liver. There are minute elevations and depressions due to the contracted trabeculæ of Glisson's capsule—glissonitis. In the area of the gall bladder we find the greatest degree of fibrous tissue replacement in the form of plaques and fine lines of fibrous tissue extending from the gall bladder, suggesting a rosette of divergent contracting trabeculæ. The liver in this area cuts with greater resistence than elsewhere.

The histological examination of portions of excised liver shows considerable variation and two pictures can ordinarily be obtained depending upon whether the hepatitis is intimately associated with the portal system or with the biliary system. The essential pathology is ordinarily a round cell infiltration with varying degrees of fibrosis. The liver cells are atrophic. There is occasionally marked hyperplasia of the bile ducts and in general the degree of inflammatory reaction is not directly dependent upon the intensity of the infection in the gall bladder. The large bile ducts and portal veins may be surrounded by scar tissue with marked infiltration with leucocytes.

The liver, the largest gland in the body, stands midway between the general and portal circulation. It concerns itself with the metabolism of all types of food material and does its work with venous blood in marked contradistinction to the kidney which performs its physiological function by the general process of oxidation. The regenerative power of the liver is very marked as is evidenced in the extreme degree of hepatic regeneration that occurs in portal cirrhosis. The fact that the liver is interposed between the general and portal circulation on the one hand and between the spleen and general circulation on the other allows it to react to a variety of offending agents, either chemical or biochemical, that may be brought to it through the portal system or have filtered into it through the spleen or are being carried directly by the

general circulation. Theoretically the liver could be affected in four ways: (1) by toxic agents circulating in the general arterial blood; (2) by transmission of deleterious material through the portal circulation; (3) by direct contiguity of tissue from adjacent organs; and (4) by means of the lymphatics between the liver and gall bladder or between the lymphatic system of the gastroduodenal segment and liver.

We believe that the liver is concomitantly or sequentially affected in most chronic gall-bladder disease and less frequently in affections of the pancreas, appendix, and in pathological conditions of the gastro-intestinal tract generally.

In our study of the after-results of surgical procedures directed against disease of the external biliary system, we found a group of surgical complications and deaths that could not be explained by the surgical trauma inflicted nor by the development of sepsis and they were unaccompanied by shock, gastric dilatation or kidney insufficiency. Upon further study of these mortalities they seemed to group themselves into three types and for convenience we have so divided them. The most frequent of these three types of clinical picture that we have observed after operations on the biliary tract is a condition of profound vasomotor depression. The patient, following an operation for cholecystectomy or drainage of the common duct, has ordinarily been behaving quite as usual. At the end of 24 to 36 hours, without any apparent cause, the patient passes into a pronounced state of vasomotor collapse, with cold, clammy extremities, wet, moist and leaking skin, a very much stimulated mentality and a facial expression not unlike the facies of fear. The condition is not associated with dilatation of the stomach and there has been ample evidence of kidney function. The intravenous administration of a 10 per cent solution of glucose, 1,000 cubic centimeters, every 4 to 6 hours and continuous Murphy proctoclysis with tap water has usually brought about a recovery. It is interesting to note that when this type of complication occurs it has usually been in cases that have had a previous operation upon the gall bladder and at the second operation have had drainage of the common duct, with palpatory or manual manipulation of the pancreas. For want of a better explanation we have interpreted this type of clinical picture as due to some pancreatic toxin or ferment as the result of the surgical trauma with inadequate liver protection.

A second type of clinical picture occurs after a varying period of time, usually the fifth day, in patients who have had a comparatively simple gall-bladder operation but who have been chronically jaundiced. A normal convalescence has been progressing up to the time of the onset of a slight degree of somnolence. They may or may not have lost large quantities of bile through external drainage. They slowly become stuporous and in the course of 12 to 24 hours pass into coma. The temperature rises to 103 or 104 degrees; kidney function has been adequate previous to this time. There is no evidence of infection within the abdomen and the condition is not one of dehydration following too rapid loss of bile through the drainage tube. Nor has there been any increase in the obstructive cholangeitis if this were present previous to the operation. We have here a condition not unlike the coma of cholæmia in a patient who is adequately drained and who has had no further increase of obstructive jaundice. We have fed these patients their own bile, either by allowing them to drink it or by giving it through a stomach tube and have not prevented the fatal outcome by these procedures. This condition is essentially a coma, occurring in a patient with a diminishing obstructive jaundice. Are we dealing with a frank case of liver exhaustion similar to the terminal stages of a portal cirrhosis or similar to an acute yellow atrophy of the liver? None of these cases showed "white bile" at operation and all of them had external drainage of bile.

Less frequently we have observed a third type of clinical picture that supervenes immediately after operations on the gall bladder. This type is infrequent and it is interesting to note that it has occurred after rather simple operations on the biliary apparatus. This lethal complication has terminated, however, a long history of gall-bladder or biliary duct infection. These patients, as a rule, have not

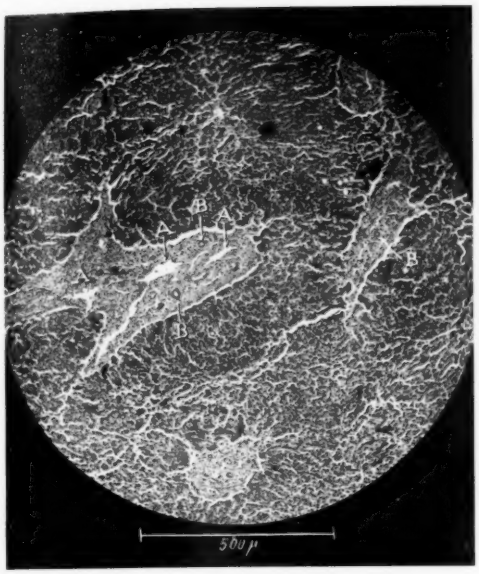

Fig. 1. Section of liver showing subacute interstitial hepatitis of comparatively recent origin, apparently subsequent to the cholecystitis which was of long standing.

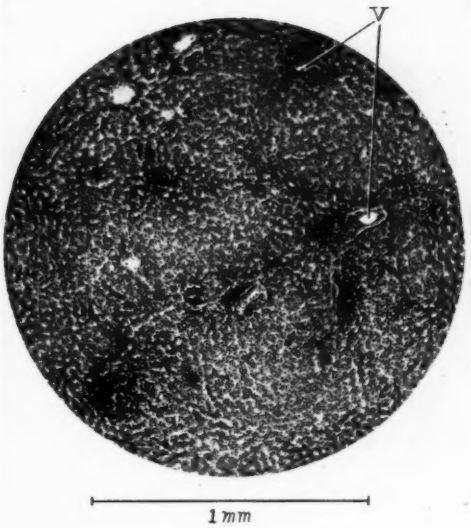

Fig. 2. Chronic interstitial hepatitis and irregular cirrhosis apparently originating about the bile ducts. *A*, portal branches; *B*, bile ducts.

been jaundiced. The clinical onset is characterized by the onset of coma almost immediately following operation. The patient ordinarily does not recover from the anæsthesia, a fact that should be noted. The temperature rises to 104 or 105 degrees, with marked acceleration of pulse, usually subsultus tendinum, carphology, and talking delirium, and more rarely marked motor excitation. Chemical tests of the blood before operation demonstrated that kidney function was adequate and within normal limits. Spinal puncture after the onset of coma has revealed an increase in fluid under pressure, cell count of 10 to 15 per cubic millimeter, with two plus globulin reaction and negative Wassermann examination.

Dr. John A. Killian, assistant professor of biochemistry of the Department of Biochemistry, New York Post-Graduate Medical School and Hospital, has undertaken the study of this condition, and we have been fortunate in being able to study the last six cases from a chemical point of view. Of outstanding interest has been the observation that these patients show a carbon dioxide combining power markedly increased above the normal representing 80 to 100 volumes per cent. This has not been due to the previous administration of alkalines and the condition has been designated chemically as an alkalosis. So far as its fatal outcome is concerned it is much more pernicious than an acidosis. Of the six cases recently studied four terminated fatally, and all of these were instances of chronic disease of the gall bladder with simple operations.

There exists in the blood plasma a buffer system, comprising acid and basic compounds. Under normal conditions the acid compounds are carbonic acid and acid phosphates, while the basic compounds are bicarbonates and alkaline phosphates. The normal blood plasma shows a slight excess of the alkalies over the acids, this excess constituting the alkali reserve of the plasma. The range of the hydrogen-ion concentration in the normal plasma is then slightly to the alkaline side ($P_H = 7.4$–7.6). It is well known that an accumulation of abnormal acid bodies, that is, acetone bodies in diabetes, or an increased concentration of

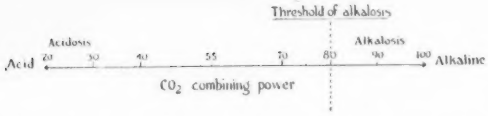

Fig. 3. An increase in the carbon dioxide combining power toward eighty indicates an alkalosis, the reverse an acidosis.

acid bodies normally present (acid phosphates in nephritis) leads to a decrease of this alkali reserve producing an acidosis. The most practical method of determining the extent of this alkali reserve is by measuring the amount of carbon dioxide that will combine with a definite amount (100 cubic centimeters) of blood plasma; the normal plasma should take up 55 to 70 volumes per cent of the carbon dioxide. A decreased carbon dioxide combining power indicates a lowered alkali reserve, that is, an acidosis. A decrease in this combining power to 40 indicates a moderate acidosis, to 30 a severe acidosis, and to 20 an acidosis which will probably prove fatal. Cases of acidosis are comparatively frequent and the methods of relieving it are well known (Fig. 3).

A carbon dioxide combining power over 80 volumes per cent would indicate the clinical and chemical condition of alkalosis. Whether this increased carbon dioxide combining power is associated with a decreased hydrogen-ion concentration has not been determined. The toxicity may be due to an accumulation of basic-ions alone, without an associated change in hydrogen concentration. These points are at present under investigation.

The normal blood sugar is represented in 0.90 to 0.120 per cent. In a great number of cases of chronic gall-bladder disease we have found the blood sugar is raised, having a variation from 0.140 to 0.200. This is due, apparently, to impairment of pancreatic function, in that diastase (amylolytic ferment) which is elaborated by the liver acquires an increased activity. The pancreas normally regulates the activity of this blood enzyme and disturbance of the pancreatic function brings about an abnormal activity or a lack of regulation of the diastase with a high blood sugar. It would seem that an underlying infection of the gall bladder causes a disturbance of balance between diastatic activity and pancreatic control.

Under normal conditions the urea nitrogen forms from 12 to 15 milligrams and the uric acid another 3 to 4 milligrams. The two together with other similar nitrogen waste products represent about half the non-protein nitrogen in a given quantity of blood. The remainder, approximately 46 per cent is the undetermined nitrogen and represents the so-called rest nitrogen. This finding in the blood is totally different from that in the urine where the nitrogen is in the form of urea to the extent of about 90 per cent of the total nitrogen. The inference to be drawn is that the body must utilize a part of this rest nitrogen in some manner because comparatively little of it appears in the urine. The liver function apparently is to split up the amino bodies much after the fashion of $R–NH_2$ plus carbon dioxide and water equal urea.

In disturbances of the liver we find that the rest nitrogen is markedly increased. In acute yellow atrophy, in the toxæmias of pregnancy we find that there is a marked decrease in the urea nitrogen and the normal relation between non-protein nitrogen and urea nitrogen does not obtain. Therefore, the liver loses the ability to split up the amino compounds into urea and hence there is an increase in the rest nitrogen in hepatic insufficiency.

Combined with the chemical determinations we have, with the assistance of Dr. Ward J. MacNeal, professor of pathology at the New York Post Graduate Medical School and Hospital, regularly carried out a pathological examination of a portion of tissue removed either from the right lobe of the liver or from both sides. The association of observed macroscopic changes in the liver with a microscopic evidence of hepatitis can be summarized by the presentation of two cases, not that they differ from others of the same type but they succinctly express the changes in the liver that we are accustomed to find.

Case 1. M. N. Chart No. 24493. Diagnosis: Hydrops of the gall bladder; cholelithiasis; hepatitis, chronic; diseased appendix.

Operation findings:

1. The liver shows a very marked Reidel's lobe, the inferior edge of which extends down on the right loin on a level with the crest of the ileum. The liver itself is about 40 to 50 per cent larger than is normal for the individual. Extending backward

from the region of the gall bladder are lines of white fibrotic tissue, giving a dimpled appearance to the liver surface, evidently due to contraction of the fibrous tissue trabeculæ. At various points on the edge of the liver are retracted areas, most prominent in the region of the gall bladder and diminishing proportionately away from it.

2. The gall bladder is the size of a large Bartlett pear, with an entire absence of either green or olive color. The wall is thickened, contains white bile and about seventy-five stones, varying in size from 1 to 2 centimeters in diameter. The cystic duct is obstructed. The common duct is negative and contains bile.

3. The pancreas is slightly hard to the sense of touch. No gross pathology is evidenced.

4. The stomach and duodenum are negative.

5. The appendix is about 4 inches in length, markedly distended, with thickening of its walls and a considerable number of adhesions about its terminal portion.

A cholecystectomy and appendectomy were performed on this patient and a portion of the right lobe of the liver was removed for histological examination. I wish to quote in full the findings in the examination of the liver: "Sections of the piece of liver show a moderate increase in connective tissue of the trabeculæ of Glisson's capsule within the substance of the liver. In this connective tissue there are excessive numbers of round cells and in some places conspicuous small bile ducts, apparently hyperplastic. The columns of liver cells are well preserved, but among the liver cells there are some very large nuclei. The endothelial cells lining the blood tissues are somewhat more numerous and more deeply staining than usual, and in these endothelial cells one finds an occasional mitotic division figure. In the sinuses there appears to be also slight excess of round cells and polynuclear leucocytes. The round cell infiltration in the connective tissue trabeculæ is rather diffuse and it is impossible to recognize that it has a closer relation to the bile ducts than the tributaries of the portal vein. The changes are evidently those of an early cirrhosis." Dr. MacNeal makes the following comment: "Subacute interstitial hepatitis and early cirrhosis apparently of more recent origin than the inflammation in the gall bladder" (Fig. 1).

CASE 2. B. K. Chart No. 24682. Diagnosis: Cholecystitis, subacute; cholelithiasis; diseased appendix.

Operation findings:

1. The liver is slightly enlarged, extending 2 centimeters below the costal margin, in the right mammary line. Some adhesions between left lobe and anterior abdominal wall. Capsule of Glisson is somewhat opaque, with white lines extending backward from the gall bladder and more particularly along the right edge of the liver, external to the gall-bladder notch, where the edge is distinctly fibrous, retracted and indented. At this point are some adhesions between the hepatic colon and the omentum.

2. The gall bladder is markedly thickened, distended, but free from adhesions. It has a red blush to it. Glands at the cystic duct are enlarged and the gall bladder contains about 100 sulphur colored cholesterin stones.

3. Stomach and duodenum negative.

4. The appendix shows chronic inflammatory changes.

Operation consisted in cholecystectomy, appendectomy, and removal of portion of liver for examination. Omitting the histological examination of gall bladder and appendix, the examination of the specimen of the liver shows the following: "Sections of the liver specimen show a remarkable increase of fibrous tissue near one end of the specimen. Here one sees nothing but fibrous connective tissue, blood vessels, and bile ducts over a triangular area which is approximately 3 millimeters in diameter. At its base this triangular area includes a few columns of liver cells. The adjacent liver tissue shows general thickening of the trabeculæ of Glisson's capsule, and there is especially marked fibrous thickening about the larger bile ducts which occur in this region. One of these bile ducts is about 0.8 millimeters in diameter. The fibrous tissue around it is from 3 to 5 millimeters in thickness. The liver tissue near the other end of the section also shows marked increase in the thickness of the trabeculæ and this connective tissue is diffusely infiltrated with round cells. In this portion the liver columns appear to be well preserved and the lobules retain their normal shape and relationships. The picture bears some resemblance to that of Laennec's cirrhosis, but the fibrosis is far advanced at one end of the section and just beginning at the other. The increase of fibrous tissue occurs about the bile ducts. Apparently this specimen comes from near one of the large branches of the hepatic duct. It also includes large blood vessels." Dr. MacNeal comments as follows: "Chronic interstitial hepatitis and irregular cirrhosis, apparently originating about the bile ducts" (Fig. 2).

CONCLUSIONS

We may therefore make certain tentative conclusions:

1. Hepatitis in some degree is almost invariably associated with chronic disease of the gall bladder and biliary ducts.

2. Hepatitis may exist as the primary or secondary lesion.

3. When hepatitis is the primary lesion infection takes place through the portal system with secondary infection of the gall bladder by way of the lymphatics. When hepatitis is the secondary lesion infection takes place from the gall bladder by way of the extrahepatic and intrahepatic lymphatics.

4. In the majority of cases the hepatitis is probably symptomless; it may occasionally be sufficiently widespread to initiate changes leading on the one hand to types of biliary cirrhosis and on the other hand to types of portal cirrhosis.

5. Cholecystitis may be secondary and of minor importance to the changes in the liver.

6. Some cases after operation show a marked degree of hepatic insufficiency.

7. The liver, pancreas, gall bladder, and gastroduodenal segment must be viewed as one physiological and pathological system, disease of one organ expressing itself in varying degrees of pathological change in the other members of the group.

8. Pancreatitis is a frequent concomitant in either hepatitis or biliary system infection.

9. In hepatic insufficiency or hepatic dysfunction, we find marked variations in blood chemistry.

NON-TUBERCULOUS GRANULOMATOUS LYMPHADENITIS

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FOUR cases of chronic granulomatous lymphadenitis have recently come to the attention of the pathological department of the Peter Bent Brigham Hospital. The resemblances of the disease to tuberculous lymphadenitis, clinically and histologically, led to animal inoculation and bacteriological study to determine whether or not the process was actually tuberculosis. The literature was also consulted and it was found that in France it was a well recognized condition. Because the disease is definitely not tuberculosis and is not generally recognized in this country, the report of our cases is warranted, being an attempt to characterize the disease as it occurs in this country.

Case 1. P. B. B. H. 35898. The entrance complaint was headache and fever; and tumor in left groin. The past and personal history is entirely irrelevant.

Present illness. The patient, a boiler-maker for 20 years, first noticed a tumor in the left groin on September 23, 1922. It grew rather rapidly until about October 21, since which time it has remained quite stationary. For 3 weeks preceding admission he had chills and fever. His temperature reached 106 degrees and he had been delirious at times. He entered the hospital with a diagnosis of typhoid.

Physical examination. The lungs showed some crepitant and piping râles, and on one occasion increased breath sounds were noted. The chest was otherwise negative. A roentgenogram of the chest was negative. There was a tumor in the left groin the size and shape of a fat sausage. It was slightly tender, but not red or warm. The temperature fluctuated between 100 and 104 degrees.

Laboratory findings. Hæmoglobin 96 per cent, red blood cells 4,832,000. White blood cells varied from 11,000 to 15,000. Polymorphonuclear leucocytes 72 per cent, lymphocytes 7 per cent, large mononuclears 15 per cent.

Pathology. Number S-22-900. Gross description. The specimen is a large mass of tissue removed from the left inguinal region. The mass measures 12 by 6 by 4 centimeters. The tissue is made up of fat enclosing numerous, much enlarged lymph nodes which on section show numerous grayish white areas that vary in size from 1 millimeter to 10 millimeters in diameter. From these lesions a puriform material can be expressed.

Microscopic examination. There are seven sections that show lymph nodes and surrounding fatty tissue. The nodes are involved in a diffuse inflammatory process. Lesions of various sizes are present. The smallest lesions are composed of collections of endothelial cells (macrophages), and a few polymorphonuclear leucocytes. Larger lesions show a softened center composed of polymorphonuclear leucocytes and débris and an outer zone made up of endothelial leucocytes, giant cells, lymphoid cells and granulation tissue. In the very large lesions, there is extensive necrosis. The necrotic material contains very few cells and is surrounded by a dense boundary of granulation tissue in which there are many endothelial cells and giant cells. The inflammatory process extends beyond the lymph node. Endothelial cells, giant cells, and polymorphonuclear leucocytes can be seen in the surrounding fat. The vessels in places are definitely thickened by an endothelial proliferation of the intima

Bacteriology. B-22-828. Smears were made from the pus and were examined fresh and stained with methylene blue and carbol fuchsin. The result was entirely negative in each instance. Cultures of pus and tissue were made in dextrose agar, Loeffler's blood serum medium, blood agar and in dextrose broth. No culture showed a growth after 96 hours' incubation. Sections were stained with Giemsa's stain for ordinary bacteria and with carbol fuchsin for tubercle bacilli. No organisms could be demonstrated.

Case 2. P.B.B.H. 37633 A stenographer, single, age 46 years, entered with complaint of abscess in the right armpit.

Past history. The patient has always lived in New England. She had whooping cough and measles in

childhood, and influenza in 1920. Her mother died of tuberculosis 30 years ago. The patient was at this time associated with her mother. She has always been subject to headaches of the migraine variety. She entered the Peter Bent Brigham Hospital, January 15, 1923, and a careful study revealed nothing but obvious undernutrition and nervousness and a history of constipation and headaches.

Present illness. The patient re-entered the hospital March 20, 1923, with the above complaint. Since her discharge from the hospital on January 31, 1923, she had been resting and had not been beyond New England. February 15, 1923, 2 weeks after leaving the hospital, she noted a small, red, slightly elevated, scar like, painless lesion about the size of two pin heads on the back of her right hand. February 21, 1923, she noted a non-tender nodule 1 by ¾ inches in two diameters in the axilla. A few days later she awoke with "a bad bilious attack." This consisted of nausea, headache, fever and at times stiffness of the neck. The fever and headache kept her in bed for 2 weeks. On February 28, 1923, the patient noted a lump at her elbow. It was the size of a large marble, non-tender and rather hard. The local physician incised the lesions of the hand about March 1, but apparently nothing was obtained. After removing the bandage on about March 7, another lesion similar to the first was noted.

Physical examination. Undernutrition was again noted. The physical examination was negative except for the local condition. There was a red, slightly elevated lesion about 3 millimeters in diameter on the right hand. Non-tender, firm glands were present in the axilla and in the epitrochlear region. There was a beaded vessel along the inner aspect of the arm, evidently an indurated lymphatic. The patient ran no fever while in the hospital except for a rise to 100.2 degrees following operation.

Laboratory findings: Hæmoglobin 85 per cent; white blood cells, 9,600.

Pathology. Operation March 23, 1923 (S-23-216). The local lesion and lymph nodes were excised.

Gross description. The local lesion consists of a piece of normal appearing skin 1 by .5 centimeters in diameters. It is interesting that the lesion had been overlooked by the local physician.

Lymph nodes. They are received in three pieces. The largest measures 3 centimeters in diameter. Its surface is covered with indurated fat and is injected on cut section. It is divided into lobules, evidently due to adherent lymph nodes. Each lobule contains several small grayish white areas from which a sticky, slightly green pus can be expressed. Surrounding these areas is a wall of pinkish gray tissue 1 to 2 millimeters in thickness. The second piece consists of a formless mass of tissue which is grayish in the center and bluish red, and injected at the periphery. These two pieces of tissue and approximately 3 cubic centimeters of sticky pus came from the axilla.

The third piece consists of a lymph node about the size of an almond, which comes from the epitrochlear region. It is somewhat firm and is gray on cut surface. There are numerous areas of necrosis from which a sticky pus can be expressed. These areas are surrounded by granulation tissue 1 to 2 millimeters in thickness.

Microscopic report. Initial lesion: Just beneath the corium is a very definitely circumscribed lesion about 2 millimeters in diameter. This lesion is surrounded by fibrous tissue. It is made up of endothelial cells (macophages), lymphoid cells, fibroblasts and polymorphonuclear leucocytes. Here and there within the lesion are collections of endothelial cells which contain an occasional giant cell. The epidermis appears quite normal.

Lymph nodes. There are sections from three nodes. One shows nothing but a slight amount ot chronic inflammation. The second section shows several small tubercle-like lesions consisting of collections of endothelial cells, occasional giant cells, and a small amount of necrosis in the center. The third node is peppered with lesions similar to the second but many of the lesions are much larger, and necrosis is much more extensive. The necrotic masses frequently contain many polymorphonuclear leucocytes and are surrounded by considerable amounts of granulation tissue.

Examination of smears. Smears were stained with methylene blue. They contained many polymorphonuclear leucocytes, endothelial cells and an occasional giant cell. No organism could be found. Examination of fresh, unstained exudate failed to show any amœbæ or fungi.

Bacteriology. The pus and tissue were cultured on dextrose agar, Loeffler's blood serum medium, blood agar, Dorsett's egg medium, and in dextrose broth. No growth was obtained. Some of the pus was put under anaerobic conditions in dextrose agar and no growth was obtained.

The pus and fragments of tissue were injected into three guinea pigs. One pig at the end of 3 weeks developed an orchitis and peri-orchitis. He was killed and a pneumococcus was found as the presumable cause. No other lesion was demonstrated. The other two pigs were killed after 5 and 7 weeks respectively and no lesion of any kind was found. Some of the pus from the pig that developed the orchitis was injected into two other male pigs without result.

CASE 3. The patient, a housewife, age 47 years, developed a small, indurated, nodular, non-painful lesion in the upper dorsal region in October, 1922. In December, 1922, the neighboring cervical lymph nodes became enlarged. December 29, 1922, the initial lesion and adjacent lymph node were excised. Microscopic study of the tissue showed marked hyperplasia of the epithelium, so marked that an epithelioma was suggested. Beneath the skin was a marked inflammatory reaction. No lymph node was made out. On January 10, 1923, two glands were removed for examination.

Pathology. Gross description of initial lesion. H-22-557. There are two pieces of tissue, one of

skin and the other of subcutaneous tissue. The skin measures 5 by 1.5 by 1.8 centimeters. From the center of the skin there projects a nodular mass over which the skin appears eroded. On section this is found to be composed of firm tissue which is not definitely circumscribed. The skin appears unusually thick. The second piece of tissue measures 3 by 2.5 by 1.8 centimeters. It is surrounded by fatty tissue and muscle. The central portion of this mass is made of yellow friable tissue.

Lymph nodes—H-23-18. The specimen consists of two post cervical glands. They are surrounded by fatty tissue and comprise masses measuring 2 by 1.6 by 1.4 centimeters and 2 by 6 by 7 centimeters respectively. On section, they are found to be composed of pale yellow tissue in which are seen white punctate areas and a few strands of pale, firmer tissue. The consistency is quite soft.

Microscopic report. Primary lesion. Sections through the nodule of the skin show the central portion occupied by a sharply circumscribed downgrowth of the epidermis in the form of anastomosing stalks which present an orderly arrangement of the epidermal cells composing them. There is some keratinization but no definite pearl formation. The free surface of the skin is covered by a thick layer of fused keratinized cells. Surrounding these epidermal structures, throughout the corium and in the subcutaneous tissue, is a heavy infiltration, composed of plasma cells, lymphoid cells, endothelial cells and an occasional giant cell. These cells also occur in miliary sized groups surrounded by young fibroblasts and bear a decided resemblance to tubercles. In the subcutaneous fatty tissue is a definite lesion. The central portion of the lesion is composed chiefly of granulation tissue with numerous areas of necrosis. Surrounding this lesion, in the fat tissue, is a heavy infiltration of plasma cells, endothelial cells, lymphoid cells and an occasional giant cell of the foreign body type. Stains for bacteria with Gram's stain and carbol fuchsin for tubercle bacilli are negative.

Lymph nodes. Section shows granulomatous areas with central areas of necrosis and softening. These central areas contain a large number of polymorphonuclear leucocytes. The granulation tissue bounding these areas shows a compact infiltration of endothelial cells and numerous giant cells beyond which are numerous lymphoid elements.

CASE 4. P. B. B. H. No. 38978. The patient was an unmarried negro of 28 years, a laborer, who entered the hospital complaining of a discharging abscess in the left groin.

Past history. Negative except for several attacks of gonorrhœa and an infected bubo which was removed in 1916.

Present illness began in December, 1922, following a slight head cold, at which time he noticed swelling with little pain in his right groin. This swelling became increasingly larger and troubled him when he moved his leg. He visited his local physician who advised poulticing. About December 29, the swelling became very soft and he again went to his local physician who incised the softened area. A small amount of thick yellowish pus was obtained. This wound remained open about 6 weeks when it closed. The glands then increased in size, the sinus reformed and again closed. In the meantime, several other sinuses formed. After the sinus formation, the glands became quite tender. There were no general symptoms. Evidence of a primary sore could not be obtained.

Physical examination. The patient was a well developed negro with a negative physical examination except for the lymphatic system. X-rays of the chest were negative for tuberculosis. X-ray of the pelvis showed no bone involvement. The inguinal glands on the right side were enlarged and matted together, forming a mass extending from about the mid-point of Poupart's ligament over the mid-line and downward over the anterior aspect of the right thigh, thus forming a triangle with a 9 centimeter base and 10 centimeter altitude. Over this area were several elevations representing enlarged lymph nodes and seven sinuses were present. The enlargement was somewhat tender and a few drops of white, flaky pus could be expressed from the sinuses. Around the orifice of each sinus was protuberent granulation tissue. The patient has a normal temperature, pulse, and respiratory rate.

Laboratory findings. Hæmoglobin 80 per cent (Sahli); white blood corpuscles, 5,700. Differential count is 67 per cent polymorphonuclears, 20 per cent lymphocytes, 12 per cent large mononuclears and 2 per cent eosinophiles.

Pathology. The entire region described above was excised down to the deep fascia, taking with it all of the glands and diseased periglandular tissue.

Gross description. Specimen is an L-shaped piece of skin with subcutaneous tissue down to the deep fascia. It was removed from the right groin. The shorter arm is the vertical arm and is dissected off from the anterior inner aspect of the thigh. It is 9 centimeters long and 4.5 centimeters in width. The longer arm is 9.5 centimeters by 6.5 centimeters and extends from the fold of the groin transversely across the pubis. The fold of the groin is creased and at its mid-point is an umbilicated depression, which during life exuded thin, yellowish pus. This umbilication is 1 by .5 centimeters. Internal to this are three globular elevations covered by thin, glazed epithelium. They measure 8 millimeters, 5 millimeters, and 4 millimeters in diameter respectively. The largest is pinkish. The two smaller are yellowish in color. On cutting through these elevations, they are found to be made up of reddish tissue which has the appearance and consistency of granulation tissue. These sinuses communicate with lymph nodes that are honeycombed by cavities lined by a gray membrane and containing a thin puriform material. In the vertical arm of the tissue, we have the lower half of the skin occupied by irregular, smooth, glazed elevations of the epidermis in which are numerous sinuses. The subcutaneous tissue con-

sists of fat with lymph nodes and a great deal of dense, cicatricial tissue which is most marked near the fold of the groin where it is continuous with the corium for an area of .5 to 1 centimeter. Embedded in this tissue are many lymph nodes varying in size from a few millimeters to 2.5 centimeters in diameter. All the lymph nodes are deep pinkish in color, friable in consistency and contain abscess cavities. In only a few is evidence of scar tissue. The cavities are small, irregular, and filled with a puriform material.

Histological examination. The sections include skin, subcutaneous tissue and lymph nodes. The skin shows a definite downgrowth due to a marked hyperplasia. Beneath the skin is a heavy infiltration of plasma cells, polymorphonuclear leucocytes and an occasional giant cell. There is also extensive granulation tissue formation in this subcutaneous tissue. This granulation tissue frequently lines sinus tracts. There is marked perivascular infiltration with the above mentioned cells. An occasional vessel shows marked thickening of the intima. The lymph nodes are distorted by disease. The capsules are distinctly thickened and fuse with surrounding tissue. There are areas of granulation tissue in the glands as well as dense scars. In addition to these older lesions are more recent lesions, consisting of groups of endothelial cells in palisade arrangement about necrotic centers. Among the endothelial cells are numerous giant cells, while the necrotic centers contain many polymorphonuclear leucocytes and lymphoid cells. Such lesions bear a strong resemblance to tuberculosis. The germinal centers of the lymph nodes that remain are markedly hyperplastic.

Examination of smears. Smears show many endothelial cells, plasma cells, polymorphonuclear leucocytes and an occasional giant cell. There are organisms both intracellular and extracellular. Many cells are packed with bacillary forms that stain poorly with Giemsa's stain. Others are cocci arranged as diplococci and in short chains. They stain deeply. Because of the numerous sinuses in this case, the material was considered of no use for cultural study.

Animal inoculation. Two guinea pigs, two rabbits, one rat, and one mouse were injected with the material from this case. The guinea pigs were injected subcutaneously, intraperitoneally, intradermally into the prepuce and into the testes. The rabbits were inoculated subcutaneously; into the anterior chamber of the eye; intraperitoneally; by corneal incision, and into the testes.

The rat and mouse were inoculated subcutaneously and intraperitoneally. The animals were killed after 5 weeks and examinations were entirely negative, except that the rabbit inoculated intraocularly developed a panophthalmitis 24 hours after inoculation, and this infection destroyed the eye.

REVIEW OF THE LITERATURE

Nélaton (9) in 1890 first clearly separated this disease from tuberculosis. The differentiation was on clinical lines and he gives a very good clinical description. His reason for believing these cases non-tuberculous was the occurrence of local lesions followed by glandular enlargement. He noted in one of his former cases that a small lesion on the little finger preceded axillary lymphadenitis of this variety. He operated and found that the suppuration took origin within the lymphatic glands, and discovered that excision led to cure. Marion and Gandy (7) in 1901 studied the pathology and made animal inoculations. They gave a very good histological description and were so impressed by the close resemblance of the histology of this condition to the histology of tuberculosis that they disregarded their negative results from animal inoculation and considered this process to be tuberculosis. Pigeon and Tanton (10) in 1906 proved very conclusively the non-tuberculous character of this particular type of lymphadenitis. They injected 120 guinea pigs, and not a single animal died of tuberculosis. They also examined 140 freshly made smears from 147 cases and found no organisms.

Bory (1) studied histologically a local lesion. Phylactos (11) also studied a local lesion and his description corresponds to that of Bory. He made a strong point of the identity of subacute granulomatous lymphadenitis and climatic bubo, and insisted on the venereal origin of the disease. This thesis is valuable for a complete bibliography.

Ravaut (12) saw cells, which on the warmed stage had amœboid movement, and believed that these cells were amœba. He thought that they resembled amœba coli rather than amœba histolytica. He claimed good results from emetin treatment.

Dufour and Ferrier (2) also reported a case with sinuses in the groin due to diseased lymph nodes which healed under emetin treatment.

There are several other articles that deserve mention. Durand, Nicholas, and Favre (3), in a very excellent article, give a summary of their experiences and investigations of chronic granulomatous lymphadenitis. They observed a large number of cases, tried various bacteriological procedures, and inoculated many animals with wholly negative results.

Gaté (5) in 1913 made this disease the subject of his Lyon thesis. He reviewed the

literature thoroughly. He reported 16 cases and did some animal inoculation work which proved negative. Gastinel and Rielly (4) in 1922 gave serious efforts to this problem. They studied 20 cases very carefully and injected many different animals with negative results. Their histological and clinical descriptions in this article are very exact. These articles are important because they firmly established the clinical entity of this disease.

DISCUSSION

Etiology. The point of first interest in a disease is its etiology. The etiological factor in this disease is not known and we are forced to rely on clinical and pathological evidence for ideas of the nature of the causative agent. The clinical and pathological evidence indicate its infectious nature. We have not been able to get information beyond that yielded by the histological studies. Cultures have remained uniformly sterile except for the culture of a diptheroid by two observers, both of whom considered the organism isolated to be a contamination, probably correctly so considering the diverse lesions from which diphtheroids have been isolated. The demonstration of organisms in the tissue and pus by practically all known technical methods have failed with the exception of Ravaut's observation (12) of amœba which has not been confirmed by subsequent observers.

Our material was examined fresh and was stained with ordinary, Giemsa's and Goodpasture's stains for organisms. No amœbæ were found. We felt very certain none was present.

The uniform negative results obtained from animal inoculations, in spite of many attempts with many kinds of animals, are most interesting. There is some evidence that the infective agent may be transmitted from one person to another. Gastinel and Rielly (4) speak of a case reported by Favre of a surgeon who contracted axillary granulomatous lymphadenitis following an injury of the hand received while operating on a case of the same disease. Durand, Nicholas, and Favre (3) report a case of lymphogranulomatosis in a lady whose lover was previously treated in the hospital for the same disease. The infective agent in the skin and mucous membrane causes a very small lesion, often only a half millimeter in diameter. The characteristic histology is found in these local lesions. We know that this infective agent operates in France and around Boston. Two questions immediately came up in this connection. Is this a new disease about Boston, and are the areas mentioned in the literature the only places where the disease previously existed? We believe that the disease has existed elsewhere and that the area is much larger than that indicated in the literature. It is probable that the diagnosis in the majority of cases has been tuberculosis. To sum up the etiology, we may assume that there is an infective agent in France and the Eastern United States which gains access usually through the mucous membrane of the external genitalia, but may enter through the skin, that this agent leads to a chronic granulomatous inflammation of the regional lymph nodes, that there is some evidence that it can be transmitted from one person to another, but not to any other animal, and that cultural endeavors and efforts to demonstrate the organism in the tissues have been wholly unsuccessful.

Bacteriology. The question of etiology of this disease has stimulated a great deal of bacteriological work. Nothing has come forth that can be entertained as a possible cause, but in order to understand clearly what has been done, it is desirable to review the range and results of the bacteriological procedures employed. In such an extensive disease of lymph nodes, secondary invaders are certain to be encountered and organisms cultivated which were considered as contaminators by the persons isolating them are: staphylococcus (albus and aureus), streptococcus, bacillus pyocyaneus and bacillus fluorescens liquifaciens.

Two types of organism were considered possible causative agents, one seriously and the other less seriously. They are an amœba and a diphtheroid bacillus. Only one observer has seen the amœba. The evidence for amœba as the cause was based on the finding of cells that had amœboid motion on a warmed stage and the clinical improvement of a case treated with emetin hydrochloride. The diphtheroid in question, after discussion was dismissed be-

cause it has been found in Hodgkin's disease and from other sources. Stains have been used to demonstrate organisms in smears and tissues. Here organisms are occasionally seen. In our Case 4 there are faintly staining intra- and extra-cellular bacillary forms and also what appear to be short-chained streptococci. In this particular case, there were numerous sinuses and the importance of these organisms, other than as secondary invaders, is doubtful. Many staining methods were employed by us, Giemsa's stain, carbol fuchsin, methylene blue, Goodpasture's stain, Leishman's stain and Levaditi's method, may be mentioned. Fresh smears were also examined by dark field illumination. All methods proved futile.

Aerobic and anaerobic culture methods were tried. Dextrose agar, dextrose broth, Dorset's egg media, blood agar, Loeffler's blood serum, and Sabouraud's media have been used in attempts to isolate the causative agent.

Much attention has been given animal inoculation. Monkeys, dogs, cats, white rats, guinea pigs, rabbits, mice, and fowls have been used. Subcutaneous, intramuscular, intraperitoneal, intracerebral, intratesticular and anterior chamber of the eye routes have been tried. Whether or not all of these routes were tried in each of the animals mentioned was not definitely stated in the literature. Incision of the cornea of a rabbit with inoculation of fresh material and intracutaneous inoculation into the prepuce of the guinea pig were done in one of our cases with negative results. The production of a second cutaneous lesion in a patient who already had the disease was also tried without success.

Marion and Gandy (7) produced local lesions in some of their animals. These appeared after 4 days and healed after 2 weeks. Animals at autopsy were uniformly negative. They believed that these local accidents were tuberculous. Subsequent observers regarded Marion and Gandy's animal inoculations as negative, while their description fails to convince one of the tuberculous nature of the lesions they produced.

Pathology. The pathology may be discussed under two heads, viz., the primary lesion and the lymphadenitis.

The primary lesions are always very small, many times only 1 to 2 millimeters in diameter. They are usually situated on the mucous surface of the prepuce, the vast majority of cases occurring in males, in the sulcus behind the corona of the glans penis. This is not invariable as they have been found on the glans, and in the urethra, and as shown in our cases on the hand and on the neck. They are non-painful and are often not noticed by the patient. The lesions may take the following forms: a small eroded area 1 to 2 millimeters in diameter, a small area of indurated, reddened skin, an area of localized marked hyperplasia of the epithelium, and according to some writers, a small herpetiform lesion. The two characteristics common to all types of lesion are their small size and non-painful nature. A third possible characteristic is their long duration, though there are reports in the literature of the primary lesion lasting less than a week. We must be cautious in interpreting these evanescent lesions as being the primary lesion of this infection. It seems very improbable that the pathology of the primary lesions illustrating this article would appear and disappear in the course of a week. It will suffice to say here that the lesions studied histologically were of several weeks' duration. In Bory's (1) case, the lesion was present 2 months. In our cases, the duration of the local lesion was made clear in the protocols. These proved cases should serve as a warning against giving undue attention to small lesions of short duration.

The primary lesions studied histologically by Phylactos (11) and by Bory were identical. Both came from the penis. Each showed a small ulcerated area beneath which there was a very heavy infiltration of inflammatory cells, consisting for the most part of plasma cells. Very few polymorphonuclear leucocytes were present. There was marked cellular infiltration along the lymphatics, with cells of the same type. In these lesions were many newly formed blood vessels and some thickening of the walls of the smaller blood vessels.

In one of our cases the local lesion simulated a beginning carcinoma so closely that this diagnosis was considered for a time. After the enlarged lymph nodes from the case came

to the laboratory it became clear that we were dealing with hyperplasia of the epidermis, which was secondary to a chronic inflammatory process in the corium and subcutaneous tissue. The inflammatory process consisted of an infiltration of corium and subcutaneous tissue in small foci with plasma cells, lymphoid cells, endothelial cells, and an occasional giant cell. These foci simulate tuberculosis. One was particularly like tuberculosis in appearance. It was lying in the subcutaneous tissue because of a central necrotic area and the presence of numerous giant cells. On the other hand, most of the lesions in the corium are without necrosis and form a picture reminiscent of the sarcoid of Boeck. This process in the local lesions is identical with that in neighboring lymph nodes.

In another of our cases, the local lesion presented itself as a small area, 2 to 3 millimeters in diameter, of slightly indurated, reddened skin. The skin in this area appears quite normal but beneath the epidermis is a small granulomatous nodule 2 millimeters in diameter. In this nodule are endothelial cells, giant cells, and fibroblasts. Again, the histology is of the same nature as that found in the accompanying diseased lymph nodes.

The disease in the lymph nodes has practically the same histology in all of our cases. There are local areas of suppuration walled off by granulation tissue which is infiltrated with endothelial cells, giant cells, and lymphoid cells. In some areas, these foci have joined, and the shape of the cavity thus formed, which is filled with polymorphonuclear leucocytes, is somewhat stellate. In other areas there is very extensive necrosis with very little cellular response. Some of the lesions resemble tubercles very closely. When the disease has extended to the surrounding lymph nodes, there is an exudate in this tissue similar to that in the glands. There are areas of necrosis which tend to heal by granulation tissue. There is also definite thickening of blood vessels by proliferation of endothelium.

The lymphadenitis so closely resembles tuberculosis at times, that tuberculosis should not surely be ruled out on histological evidence. There are two histological differences which are quite constant and should suggest this condition. The more important is suppuration instead of caseation in the center of the lesion. Giant cells are not so frequent in the zone surrounding these suppurative foci, which is the second difference.

Climatic bubo has been suggested as a similar disease from time to time. In his Lyon thesis in 1922 Phylactos asserted that climatic bubo and the disease under consideration are identical. In reviewing the pathology of climatic bubo, several textbooks on tropical medicine gave no characteristic histology. They speak of a diffuse infiltration of plasma cells, associated enlargement of the gland and thickening of the capsule, and call attention to small areas of hæmorrhagic necrosis. In 1910, Letulle and Nattan-Larrier (6) made a histological study of a single case. They concluded that the histology was not like tuberculosis and illustrative histological drawing did not suggest the condition with which we are dealing.

Mueller and Justi (8) in 1914 made a careful histological study of climatic bubo and describe suppurative foci surrounded by endothelial cells in palisade arrangement. This, of course, suggests the pathology of granulomatous lymphadenitis, but they do not mention giant cells and their illustrations of the histology do not suggest the histology of chronic granulomatous lymphadenitis. We feel that the identity of these conditions is not proved.

Clinical course. The clinical picture and course of the disease have been clearly described from time to time by different observers. Nothing of much importance has been added since the original description of Nelaton (9). The reason for this is the close similarity of all cases. The story is that of a small lesion which may easily escape notice, and has been overlooked in more than half of the cases because of its small size and non-painful character. The lesion has usually been on the mucous membrane of the external genitalia, notably on the prepuce, but, as shown in our case reports, it may occur anywhere on the body. The lesion, when first observed, may present one of several appearances, vesicular (herpetiform), ulcerated with or without induration, or wart-like. These different aspects

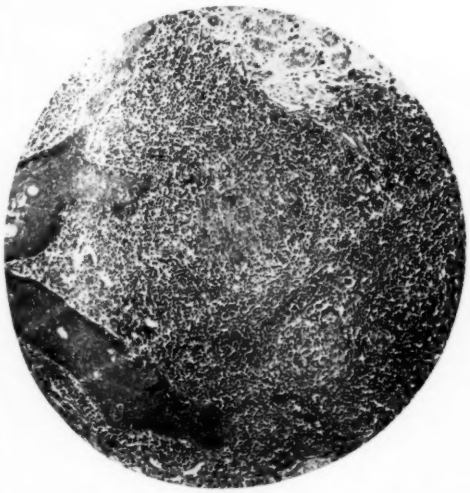

Fig. 1. Photomicrograph. Microplanar 42 millimeters. To show the histology of the local lesion in Case 3. Note the hyperplasia of the epidermis with two granulomatous lesions containing giant cells in the corium and a mitotic figure near one of these granulomatous lesions.

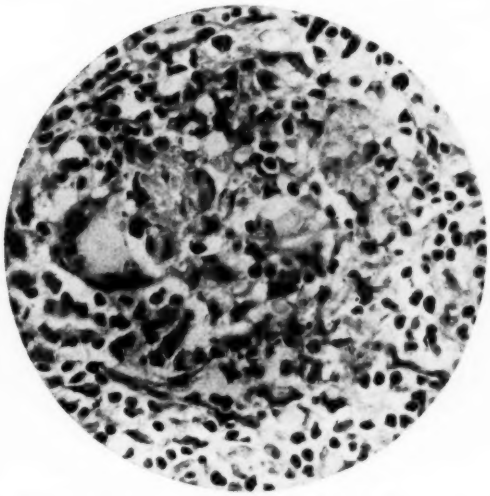

Fig. 2. Photomicrograph one-seventh inch objective. To show the types of cells present in local lesion. Note the giant cell and preponderance of mononucleated cells.

probably represent stages in the progress of the infection. Enlargement of the regional lymph nodes rapidly follows the occurrence of the initial lesions. They may enlarge quite rapidly at first and then cease to increase in size altogether, or enlarge very slowly. While the glands are enlarging, there may be general symptoms which consist of temperature, nausea, vomiting, and slight leucocytosis (10,000 to 15,000). The temperature, when present, lasts about 2 weeks when it returns to normal and usually remains normal. From this point on, the course of the process is slow. The glands may become adherent to the skin, due to the inflammatory reaction, which was at first confined to the lymph glands, extending to the surrounding tissue. Sinuses then form from which a small amount of sticky pus exudes until secondary infection takes place, after which the pus becomes more abundant and less viscous. There are periods of subsidence and acceleration. The condition is extremely chronic and in this corresponds to the pathology. A number of glands with numerous foci of necrosis are walled off by granulation tissue and endothelial phagocytes. Each focus tends to reach the surface and to discharge by a separate sinus, making healing slow inevitably. The glands are not hot or tender if examined before they become secondarily infected following sinus formation. After this occurs, they may be somewhat tender. A number of glands are involved and the mass feels lobulated. The glands are at first hard but later develop foci of softening, due to small areas of necrosis. Needle puncture may bring forth a few drops of sticky grey pus. Examination of the pus shows many polymorphonuclear leucocytes, many endothelial cells, and an occasional giant cell, but no organisms. There is very little pain associated with the condition. The patient may complain of a little stiffness and difficulty in walking if the glands are situated in the groin. The patients have been adults, usually males, from 16 to 40 years of age. In a series of 20 cases, 19 were males. The groin is most frequently involved. The involvement may be bilateral, but is usually unilateral and the left groin is more frequently involved. It will be noted by our case reports that the distribution of the involved glands and the sex of the patient has not held in our cases. It seems quite clear that any glands may become

Fig. 3. Photomicrograph one-third inch objective, showing a granulomatous lesion in the skin, and adjacent coil glands of Case 2.

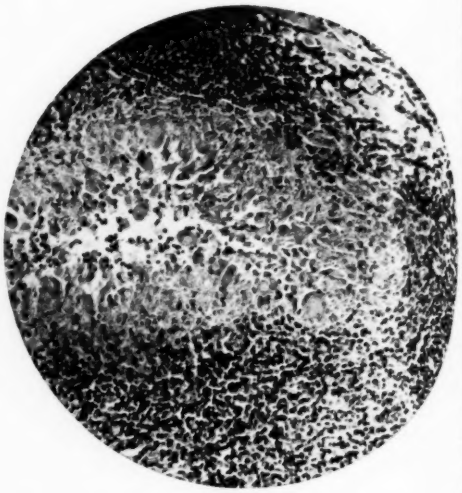

Fig. 4. Photomicrograph one-third inch objective, to show lesion in a lymph node. Note the palisade arrangement of endothelial cells and giant cells about a softened area.

involved since the infection may gain access through both skin and mucous surfaces. It is not correct to maintain that this is a venereal disease, or even a disease confined to the inguinal region. Anything else that turns up in the routine physical examination is as far as is known irrelevant. No lesions have been observed beyond the involved lymph glands. The time relationships of the initial lesion, the glandular enlargement, and the general symptoms are brought out in the case reports.

Diagnosis. The difficulty in separating this condition from tuberculous lymphadenitis in clinical diagnosis is apparent. The diagnosis at times may be difficult with tissues for microscopical examination. When the clinical picture is complete, viz., the local sore, the lymphadenitis, and general symptoms, it is not so difficult if we are dealing with a non-tuberculous patient. If only the enlarged glands are present, it may be impossible to separate the condition from tuberculosis. In this event, animals must be inoculated with pus from the sinuses; or the gland must be resected and studied histologically and by animal inoculation. Histological examination alone is not always sufficient. It is interesting to note that Marion and Gandy (7) in spite of their negative results from animal inoculation continued to regard this condition as tuberculous, so deeply impressed were they by the histological resemblances.

Hodgkin's disease is easier to rule out, even in the absence of the complete picture. Granulomatous lymphadenitis does not pass from gland to gland, a group of glands is involved and the disease stops there. Hodgkin's disease does not form sinuses or areas of fluctuation. If only a few glands are involved and no fluctuation is present, it may become necessary to remove a gland for diagnosis. The histology of chronic granulomatous lymphadenitis does not resemble that of Hodgkins' disease.

Chronic glanders was thought of in one of our cases because of a small erythematous lesion, an indurated lymphatic and subsequent enlargement of lymph nodes. The history of contact with horses, and especially horses that are diseased, is of course important in this differentiation. The local lesion of chronic granulomatous lymphadenitis is usually single and does not have the characteristics of the local lesions of glanders. They do not exude a mucopurulent material as does the lesion of glanders. In addition to what has been said,

we can get very definite information on glanders by searching for the glanders bacillus and the effect of this bacillus on the male guinea pig. The Mallein test is also available.

Bubonic plague has caused confusion in France when there were a number of ambulatory cases. This disease must be excluded by bacteriological methods. In suspected cases, glands should be punctured and bacilli demonstrated in the smears, in cultures and by pathogenicity to guinea pigs.

Chancroid may suggest itself. Much here depends on the local lesion with its irregular serpigenous margin which usually extends. The tendency to form a second lesion in adjacent tissue is also significant. Again, bacteriological methods are available.

Syphilis should be mentioned. It does not cause much difficulty. The local lesion in the majority of instances is very suggestive. The glands very rarely suppurate and when they do the suppuration is due to a separate infection, either gonococcus or secondary pyogenic invaders. Spirochætæ are easily demonstrated by dark field illumination. By the time the glands are much enlarged spirochætæ have invaded the blood stream and we have a generalized glandular enlargement and a positive complement fixation test.

Climatic bubo may be more difficult to differentiate. The two diseases are held identical by one observer, and do have many points in common. Their identity cannot be disproved, but we feel that the evidence is still insufficient to consider them as identical. For differentiation, we can only point out the differences. The clinical history may be the same in the two conditions, but usually the climatic bubo has quite a severe general reaction which quite frequently is absent in chronic granulomatous lymphadenitis. A large percentage of cases of climatic bubo heal spontaneously, which is not the case with chronic granulomatous lymphadenitis in our experience nor the impression obtained by reading the literature. The histological description of the two conditions has been quite different. Giant cells are not mentioned in climatic bubo, but focal lesions in lymph nodes, as well as the palisade arrangement of endothelial cells are described. However, it seems quite certain

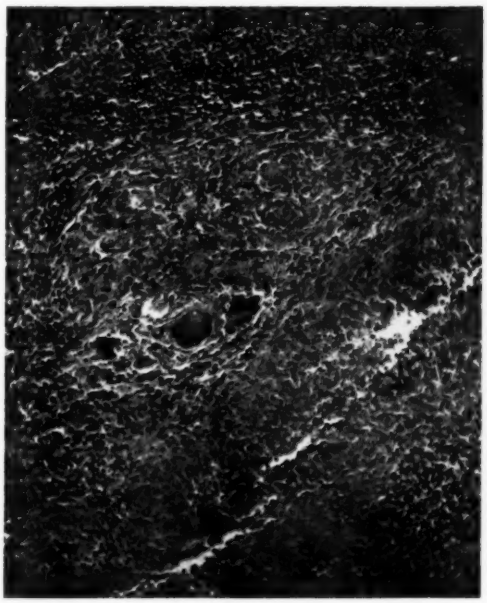

Fig. 5. Photomicrograph one-third inch objective. It shows a tubercle-like lesion in a lymph node.

that focal lesions with palisade arrangement of nuclei are not always present in climatic bubo, while the histological illustration of such a lesion in Mueller and Justi's (7) article does not correspond fully with the histological picture seen in chronic granulomatous lymphadenitis.

Prognosis and treatment. The prognosis is never grave. The possibility of spontaneous healing after softening of the glands has taken place is very doubtful. Surgical removal of glands and surrounding tissue leads to prompt recovery.

The treatment may be divided into medical and surgical. The medical treatment has consisted of the administration of iodine, iodides, and more recently emetine hydrochloride. The surgical treatment consists of draining softened areas or removing the entire mass of glands.

The results, of course, depend largely on the treatment employed. We may say with reference to the iodide and iodine treatment that one observer (10) using this treatment in 20 cases did not have a single case in which the

lesion healed after a long stay in the hospital. The reports on the results of emetin treatment are not numerous and we can only refer the reader to the enthusiastic authors (6 and 7).

After the formation of foci of softening, the only rational treatment is complete surgical removal. It is yet too early to say whether or not emetin will be highly specific in these cases. If we recall the pathology, we can see how futile it is to try to drain the softened areas because of the numbers and small sizes. The only procedure from which we can expect results is the removal of all the affected glands and surrounding diseased tissue. This is the treatment that Nélaton found most effective, and, according to the literature, his finding still holds good.

Our cases were treated in this manner and the results are as follows: Case 1 was operated upon November 9, 1922, and was discharged December 7, 1922, cured. Case 2 was operated upon March 22, 1922, and discharged April 1922 cured. She returned to the Clinic in May 1922 perfectly well. Case 3 was operated outside on January 10, 1922. A report May 22, 1923 gave the information that she was well. Case 4 was operated upon July 6, 1923, and the diseased lymph nodes. surrounding tissue, and skin on which the sinuses opened was excised in one mass. Following the operation, there was low grade infection of the wound, but this cleared up rapidly under sunlight and Dakin's solution. Because of the area of skin lost, it was necessary to skin-graft. This was done successfully July 30, 1923.

The patients should be operated upon before sinuses form. The reason for this is that the skin on which the sinuses open must also be removed with the glands, and at times this area is quite large.

SUMMARY AND CONCLUSIONS

The article deals with a non-tuberculous granulomatous lymphadenitis which is a clinical and pathological entity. The infective agent enters through the skin or mucous membrane and leaves a very small, non-painful lesion which may persist for several months. The accompanying lymphadenitis is extremely chronic, finally leading to peri-adenitis and sinus formation. The two diseases that give difficulty in diagnosis are tuberculous lymphadenitis and climatic bubo. The only way to rule out tuberculosis with certainty is by animal inoculation; because the clinical picture sometimes is incomplete and at times the histological resemblance to tuberculosis is striking. Climatic bubo is by some authors considered an identical disease. There are some striking differences in the clinical history and pathology in these two diseases.

The bacteriological procedures and animal inoculation have yielded no suggestion as to the etiology. As far as is known the material is not pathogenic for animals other than man Surgery, which aims at the removal of the affected glands and periglandular tissue when involved, leads to prompt recovery.

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AN ADENOCARCINOMA AND A ROUND CELL SARCOMA ARISING IN THE SAME UTERUS

A Report of a Case With a Review of the Literature

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THE exact status of a small group of cases, in which a sarcoma and a carcinoma have occurred in the same uterus, has been the subject of a prolonged and active discussion among pathologists especially interested in uterine tumors. Virchow (21) referred to these tumors under the name "carcinoma sarcomatodes" believing that they were true mixed tumors in which both connective tissue and epithelium were represented in the neoplastic growth. Subsequent opinion has been divided, certain authors upholding Virchow's conception and others taking the view that these cases are instances of two separate tumors arising independently in the same organ.

The object of this paper is to report a case in which an adenocarcinoma and a round cell sarcoma occurred in the same uterus, with a brief review of the literature on this subject.

CASE REPORT

Clinical history. L. W., a white female, aged 60 years, was admitted to the Hospital of St. Raphael, New Haven, Connecticut, on January 18, 1921, complaining of vaginal bleeding. The family history was irrelevant. The patient was married at the age of 19 and had given birth to four children. She had had no miscarriages. Her menses began at 14 and had always been normal. At the age of 50, her periods became irregular and after about 1 year there was complete cessation.

The patient attributed the beginning of her illness to a fall about 8 years ago, after which she experienced a heavy sensation in the pelvis and noticed that her uterus was prolapsed. For about 6 months she has been in poor health and has lost a few pounds in weight. In the latter part of December, 1920, she noticed a slight bloody discharge from the vagina. A week later this bleeding became quite profuse and she came to the hospital.

The physical examination was essentially negative except for the abdomen and pelvis. There was a freely movable tumor mass extending from the pelvis to a point about 7 centimeters above the symphysis pubis. Vaginal examination showed a tumor filling the cervical canal. The surface of the tumor bled freely upon palpation.

Clinical diagnosis: Carcinoma of the cervix of the uterus.

Operation: January 19, 1921. (Dr. W. F. Verdi) Panhysterectomy. No metastases were noted in the course of the operation.

The patient was discharged from the hospital 3 weeks after operation and was apparently in good condition.

Subsequent course. For 3 or 4 weeks the patient was quite comfortable. After this interval a hard mass developed beneath the operative incision. There was severe pain in her back and great difficulty in defæcation. The patient became gradually weaker and about March 15, developed a cough and raised blood-streaked sputum. At this time she complained of tightness in her chest and difficulty in breathing. On March 25, she developed anuria, became comatose, and died on April 2.

Pathological note (Surgical number 210–1921). The specimen is a uterus with the right tube and ovary. The uterus is 9 centimeters in length. The transverse and anteroposterior diameters measure 4 by 2.5 centimeters at the fundus and 7 by 5 centimeters at the cervix. The external os measures 4 centimeters in diameter. The external surface of the uterus is covered with numerous adhesions. There is an ovoid tumor situated in the anterior wall, measuring 7.5 by 5 by 4 centimeters, and extending into the cervical canal. The portion of the tumor which projects from the cervix is smooth and glistening. A longitudinal section through the uterus reveals the entire tumor. Its cut surface is greyish white, very cellular looking and quite soft (Fig. 1). There are irregular areas of necrosis which give a lobular appearance to the otherwise homogeneous granular surface. In some areas the tumor extends from the endometrium to the serosa. In most places, however, a narrow border of myometrium is seen at the periphery of the growth. The remainder of the uterine wall is a shade lighter in color in its inner two-thirds than in the outer portion. There are no tumor nodules in the posterior wall.

The endometrial surface is slightly irregular in appearance over the entire fundus. In the anterior wall this is particularly marked and examination with a hand lens shows numerous minute papillary elevations. Over the tumor in the anterior wall the endometrium also shows similar irregularities. The endometrial lining of the posterior wall is relatively smooth. The tube and ovary show nothing noteworthy.

Microscopic note. The sections present an interesting and complicated picture with the characteris-

Fig. 1. An adenocarcinoma and a round cell sarcoma in the same uterus. Gross drawing of the right half of the uterus showing a round cell sarcoma in the anterior wall of the body and an adenocarcinoma appearing grossly as minute elevations of the endometrium in the anterior wall of the fundus of the uterus.

tic features of a round cell sarcoma and an adenocarcinoma of the body of the uterus (Fig. 2).

In the fundus and to a lesser extent throughout the body of the uterus, the mucosa is irregular and shows numerous tufts and finger-like processes projecting from the surface. These processes form small mounds of epithelium consisting of several layers of cells without any supporting stroma and in some areas they are partially confluent and form nodular elevations of epithelium with crenated surfaces. In other areas they form delicate fusiform or thread-like strands. There are all gradations from a simple piling up of the surface epithelium to distinct papillæ having a definite supporting stroma (Fig. 2, high power insert B). There are occasional branching strands with a few groups of glandular epithelium in the stroma. The surfaces of the papillæ are covered with a single layer or several layers of cylindrical epithelium. The cells are fairly uniform in appearance, but, in areas in which several layers are seen, the cells are irregular in shape. The nuclei are large and oval in shape, varying from the clear vesicular to the deeply pycnotic. Mitotic figures are occasionally seen. Beneath the surface epithelium there are many typically carcinomatous alveoli. These alveoli are irregular in shape and size and show numerous minute papillary projections into their lumina (Fig. 6, high power insert A). They are lined with a single layer or several layers of epithelial cells similar to those described for the surface epithelium. Throughout the uterine wall there are many glandular structures similar to those described above. These glandular elements are not accompanied by endometrial stroma.

In the peripheral portion of the uterine wall, the carcinomatous alveoli are less numerous and show evidences of degenerative changes. Throughout this area there is a large amount of mucoid material surrounding the alveoli and extending between and widely separating the muscle bundles.

Sections through the large nodule in the anterior wall show a typical round cell sarcoma (Fig. 2, high power insert A). The tumor involves the entire anterior wall and extends from the endometrium to the external surface. There are numerous areas of necrosis throughout the tumor. The cells are quite uniform in appearance and have relatively large, round, or oval vesicular nuclei. Mitotic figures are occasionally seen. There is a delicate intercellular stroma. In some sections there are a few carcinomatous alveoli within the sarcoma.

The case may be briefly summarized as follows: There is a typical round cell sarcoma of the body of the uterus in association with an adenocarcinoma. The latter tumor is atypical in that it does not present a definite focal neoplasm but is spread over the endometrial surface in the form of minute papillæ. These minute growths are most marked in the fundus. There is widespread invasion of the uterine wall by nests of carcinomatous cells.

The sarcoma forms a large tumor nodule occupying a considerable portion of the anterior wall of the uterus. There is extensive involvement of the endometrial stroma suggesting that this was the site of origin. Occasional carcinomatous alveoli are seen within the sarcoma.

The question might be raised concerning the possibility of the case being one of a diffuse adenomyoma associated with a round cell sarcoma, but the entire absence of endometrial stroma (Cullen, 4) accompanying the glands precludes this possibility.

There are apparently two separate and distinct tumors, one of which is a round cell sarcoma and the other a diffuse adenocarcinoma, with areas in which one has invaded the other.

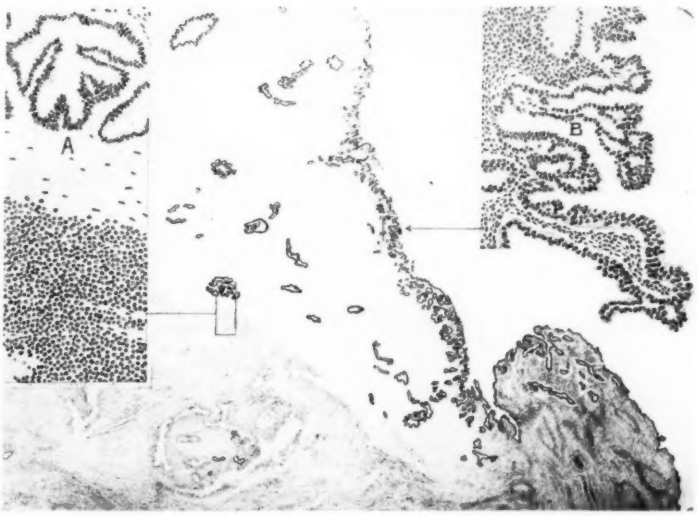

Fig. 2. An adenocarcinoma and a round cell sarcoma in the same uterus. Low power drawing showing diffuse minute papillary elevations of the endometrium and a diffuse infiltration of the uterine wall with carcinomatous alveoli. The lower portion of the drawing shows the round cell sarcoma within which a few carcinomatous alveoli are seen. High power insert *A* shows a portion of the sarcoma with a carcinomatous alveolus near its border. There is no endometrial stroma accompanying the invading glandular alveoli. High power insert *B* shows the papillary structure of the carcinoma along the endometrial surface.

DISCUSSION

A review of the literature reveals only a few instances in which a carcinoma and a sarcoma have been found in the same uterus. Cases in which the two types of neoplasms were found in the body of the uterus have been described by Rabl-Rueckhard (19), Niebergall (17), Emanuel (5), Franque (8), Gebhard (9), Opitz (18), Nebesky (16), Schaller (20), Ballin (3), Frankel (7), Amann (2), Albrecht (1), and Ivanoff (13); and Montgomery (15) and Franque (8) have each found a sarcoma of the body of the uterus associated with carcinoma of the cervix.[1]

An analysis of the nine cases in which the history was available shows that they all were in women who had reached the menopause. The youngest was 47 and the oldest 64 years old. One case was a nullipara, the others were women who had had from one to five children. The duration of the illness varied up to 4 years.

In all of the reported cases the sarcoma had been polypoid in form with as a rule a very small pedicle. In two instances (Rabl-Rueckhard, 19; Niebergall, 17), the tumor was spontaneously extruded. The histological structure in all cases was a round cell or spindle cell, with giant cells present in three cases (Schaller, 20; Opitz, 18; and Nebesky, 16).

The carcinoma was, in all cases, glandular in type (adenocarcinoma) and in most instances, as in the case herewith reported, definitely papillary in structure. There was generally an involvement of a considerable portion of the endometrium. In one case (Nebesky, 16), there were areas showing a squamous cell "metaplasia" with typical epithelial pearls.

The status of these cases has been the subject of a prolonged discussion and different authorities have expressed directly opposite opinions. The name carcinoma sarcomatodes, which implies a true mixed tumor, was given

[1] There are a number of additional cases reported as carcinosarcomatodes or as instances of the simultaneous occurrence of a carcinoma and a sarcoma in the same uterus, which are not included because they have not withstood the critical examination of subsequent observers.

to these neoplasms by Virchow (21). Opitz (18), Nebesky (16), and Von Gusserow (11) are strong proponents of this conception, and the latter author states that the combination of a sarcoma and a carcinoma is frequently observed in the uterus. In spite of this statement, the number of reported cases as already indicated is relatively small. Kahlden (14) and Gessner (10) have taken the opposite view and express the opinion that mixed tumors of this character do not occur. However they believe that a carcinoma may develop in a uterus in association with a sarcoma of relatively long duration.

Herxheimer (12) reviewed the literature in 1908 and found only about twenty authentic cases of carcinosarcomata including the uterus, ovary, thyroid, mammary gland, pharynx, œsophagus, stomach, gall bladder, and pancreas. He concludes that the majority of cases in which a carcinoma and a sarcoma have been found in the same uterus are not examples of a mixed tumor but of the simultaneous occurrence of two separate and distinct neoplasms. Furthermore he believes that in many instances the diagnosis of a sarcoma has been based on the presence of a very cellular stroma in a carcinoma and also that some cases were instances of a sarcoma in which an atypical proliferation of the glands has been mistaken for carcinoma. After a careful review of these he decides that there are, at most, only three to five instances of reported carcinosarcomata of the uterus which will withstand a critical analysis. Among these he includes cases reported by Gebhard (9), Frankel (7), Nebesky (16), Opitz (18), and Franque (8); while Nebesky (16) includes the cases described by Amann (2), Ivanoff (13), Gebhard (9), Opitz (18), Frankel (7), and himself.

In discussing the origin of carcinosarcomata, Herxheimer mentions three possibilities: (1) that a carcinoma and a sarcoma may develop simultaneously as the result of the same cause acting on different tissue, (2) that atypical proliferation of epithelium on the base of a pre-existing sarcoma may lead to the development of a carcinoma within a sarcoma, and (3) that the stroma of a carcinoma may undergo a carcinomatous change.

All three possibilities have been suggested for the explanation of individual cases. The majority of authors have considered the sarcoma, usually the largest tumor, to be the oldest and have suggested the second explanation.

Ewing (6) recognizes the occurrence of the following groups: (1) the simultaneous occurrence of two separate tumors, which may invade one another, (2) the development of carcinoma at the point where a submucous or mural sarcoma meets the epithelial layer, and (3) carcinomatous changes in the glands of a sarcomatous or inflammatory polyp.

In the reported cases in which this condition has been described, the individual tumors include the usual types of uterine neoplasms; namely the usual round, spindle, and giant cell sarcomata and adenocarcinomata with only a single instance in which squamous cells and epithelial pearls were also present.

The case herewith reported showed a typical round cell sarcoma. The carcinoma was atypical only in the diffuse involvement of the endometrium and the absence of a gross primary nodule. The picture does not suggest a true mixed tumor but would appear to be a clear-cut instance of the occurrence of a round cell sarcoma and an adenocarcinoma in the same uterus.

The author wishes to take this opportunity to express his indebtedness to Dr. W. F. Verdi for the specimen, the clinical history and for permission to report the case, and to Dr. M. C. Winternitz in whose laboratory the author was working when the specimen was received.

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DEPARTMENT OF TECHNIQUE

A NOTE ON AMPUTATIONS, WITH SPECIAL REFERENCE TO THE "SLEEVE" AMPUTATION OF THE THIGH IN SEVERE INJURY AND DISEASE[1]

By SIR WILLIAM I. deC. WHEELER, M.D., F.A.C.S. (Hon.), Dublin, Ireland

NOTWITHSTANDING the experiences of the War, there is often hesitation in departing from time-honored teaching. This is particularly noticeable in the case of amputations.

To those who were members of the War Office Committee of Surgeons and Limb Makers on Artificial Limbs (afterward attached to the Ministry of Pensions), it became obvious that many of the ideas about amputation, disseminated through the medium of textbooks, were fundamentally at fault. Thus, it was generally agreed that there was no place, or very little place, for amputations about the foot which are associated with the names of Lisfranc, Chopart, Roux, etc.; and that Symes' amputation could be improved upon by dividing the tibia and fibula at a higher level.

It was the opinion of most surgeons and limb makers that amputations through the knee joint were undesirable, for it was impossible properly to fit an artificial limb to a stump constricted below the middle and broad at either end. Furthermore, the projection of the knee joint of the artificial limb in the sitting posture was unsightly, except in females when this deficiency was hidden from view by a skirt.

The operations of Faraboeuf and Teale were condemned by most observers, and in most cases the retention of the patella, as in the operations associated with the names of Stokes and Gritti, was shown to be a handicap to the limb makers, unless section of the femur was made at a level unnecessarily high. Amputation at the hip was found to be best when performed by skin flaps and the muscles cut very short, the neck of the femur being divided, and the head left behind to fill up the acetabulum. The best results were obtained when the soft parts were cut so short that they could not push the artificial limb off the tuber ischii. Operations less than 3 inches above and below the level of the knee joint or elbow joint were avoided. Corner did a service to the profession in emphasizing these matters, and in pointing out that the amputations remaining in use in the lower limb were: (1) amputation of the toes, (2) Symes' amputation, (3) through leg amputation with skin flaps, (4) amputation of thigh with long anterior and short posterior flap, and (5) amputation through the neck of the femur with skin flaps.

In the upper limb there remain: (1) amputation of the fingers, (2) amputation of the forearm with equal skin flaps, (3) a circular amputation of the upper arm, and (4) Spence's amputation at the shoulder.

The "sleeve" amputation, referred to in the title of this communication, is a method designed to meet certain emergency operations with the least possible surgical risk, and with a view to the conservation of the longest possible stump. The orthodox method of obtaining healthy flaps well above the injury or disease is departed from, and the amputation is carried very much lower than most textbooks would sanction.

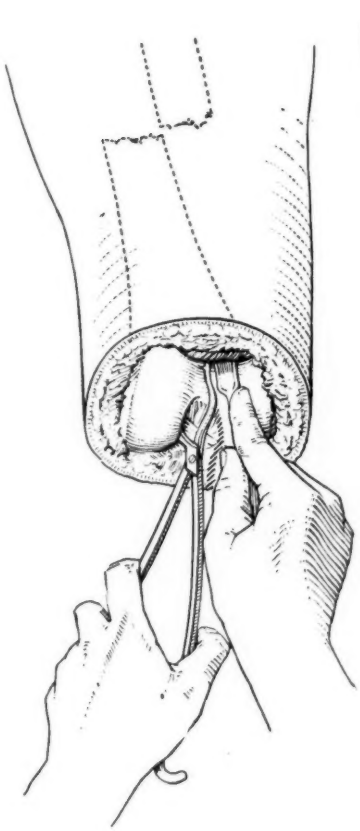
Three patients at present under observation will suffice to illustrate the method of amputation which, during the past few years, has been found serviceable in these and many other cases. The actual operation is carried out along the lines suggested by Sampson Handley,[2] but the general principles involved are not the same.

Case 1. In 1916, a strong laboring man was run over by a motor lorry and sustained a fracture about the middle of the shaft of the right femur. Ten days afterward he was seen by the writer.

The leg, from the foot to just below the knee, was gangrenous: the thigh was enormously swollen, red and œdematous; the skin was mottled and vesicated, and large patches of black and purple discoloration extended over a wide area. The thigh had all the appearance of the early stages of moist gangrene which had already destroyed the leg. The œdema, vesication and discoloration extended upward on the abdomen. A tourniquet could not be employed owing to the condition of the soft tissues and

[2] Brit. M. J., 1917, ii, 24.

[1] Read at Des Moines Tri-State District Medical Association, October, 1923.



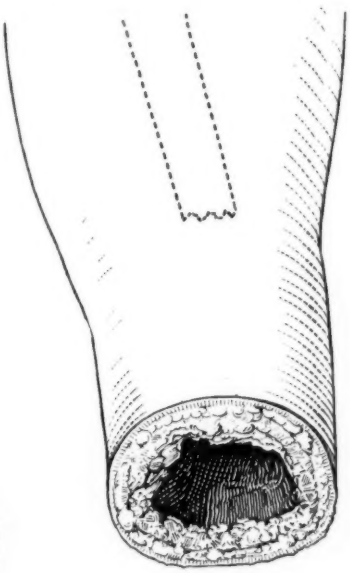


Fig. 1 (left). Sleeve amputation. The limb is removed by circular amputation and the bone shelled out in the manner shown.

Fig. 2. Diagram to illustrate the appearance of the stump after amputation.

for the same reason digital compression of the vessels was impossible. An incision was made exposing the upper portion of the femoral artery for a length of 2 or 3 inches in order to ascertain its condition. The artery was pulsating in the upper portion of its course, and was held by an assistant between finger and thumb. A circular amputation was quickly performed through the knee joint, just above the line of definite gangrene. The incision was carried above the margin of the patella in front, and the quadriceps extensor tendon divided. The attachments of the soft tissues to the femur were separated with knife and periosteal elevator until the lower segment could be withdrawn by the rotatory movements of a heavy bone forceps, like a cork from a bottle. When the assistant released the femoral artery *there was no bleeding whatever at the end of the stump. At this level the vessels were thrombosed and obliterated* (Figs. 1, 2, 3).

The lower half of the thigh had now the appearance of the sleeve of a coat from which the hand and forearm have been removed. The sleeve was left open and lightly packed with iodoform gauze.

The man made an uninterrupted recovery, except that there was an extensive sloughing of the skin in the upper portion of the thigh. He was seen in August, 1923, 7 years after operation, and was walking without pain or discomfort with his artificial leg. A scar about the size of the palm of a hand in front indicated where the skin sloughed and was skin-grafted, and the scar through which the femoral artery was exposed was well marked on the inner side (Fig. 4).

An X-ray photograph showed irregularities about the end of the femur, and the formation of well marked osteophytes. Owing to the adequate covering of soft tissues these have given rise to no pain or discomfort whatever.[1]

It is worthy of note that in this case, and in the other two cases to be mentioned, there was no tendency to abduction or flexion of the stump following the "sleeve" amputation, and that a stump with all the appearance of approaching gangrene, and with thrombosis of the main vessels recovered with limited sloughing of the superficial tissues.

[1] Muirhead Little, Brit. M. J., 1917, states that osteophytes are rarely a cause of disability.

Fig. 3 (left). Case 1. The large scar indicates area of superficial sloughing; the inner scar, the site of exposure of the vessels.

Fig. 4. Illustrating voluntary flexion of stump in Case 1.

I am indebted to Doctor O'Neill and Doctor Coady for their assistance and advice in the management of the case.

CASE 2 illustrates the good result which can be obtained by amputating by the "sleeve" method well below and not above the area of septic infection.

In 1920, a policeman was shot in the upper portion of the left thigh, and sustained a compound fracture of the femur. He was seen 6 months later, in consultation with Dr. O'Malley of Galway.

There was no attempt at union of the fractured bone. The soft tissues at the upper portion of the thigh in the region of the fracture were riddled with sinuses. Each discharging sinus led to bare bone at the site of fracture. The patient was very ill, pale, wasted, and anæmic. There was albumin in the urine, and there was no doubt in our minds that as a *dernier résort* an amputation should be expeditiously performed.

To obtain healthy flaps and remove the disease, an amputation through the hip joint or through the neck of the femur was indicated. Here, again, the high mortality from such a procedure in such a case was obvious, and the great permanent disability of a through hip amputation, even if the patient survived, required consideration.

An amputation by the "sleeve" method was decided upon. The incision was made round the knee joint, as before, passing just above the patella in front. With knife and periosteal elevator the lower fragment was freed and extracted by traction and rotatory movements of the leg. Primary amputation through the knee joint, as in the first case, was dispensed with. The stump consisted of a long sleeve, riddled, in this case, with sinuses in the upper portion.

Fig. 5 (left). Case 2. Compound fracture of femur in upper third. Amputation by sleeve method 8 months after injury. The line of section is well below the sinuses in soft tissues.

Fig. 6. Another view of Case 2 to indicate how an amputation through the hip joint was avoided by adopting the sleeve method.

The general condition of the patient rapidly improved, until, after a prolonged convalescence, there was complete recovery. A painless serviceable stump remains, which, I am informed from Blackrock Ministry of Pensions Hospital, lends itself well to the fitting of a modern artificial limb. The illustrations show the position of the multiple healed sinuses in the upper portion of the stump (Figs. 5 and 6).

CASE 3. The third case illustrates the gain of cutting through and not above septic tissues, when adopting the "sleeve" plan of amputation in certain cases of osseous disease.

A lad, about 12 years of age, at present under treatment in Mercer's Hospital, suffered from osteomyelitis of the lower end of his femur for over a year. Frequent palliative operations had been performed before admission to the hospital—the soft tissues laterally and posteriorly were riddled with many sinuses leading to dead bone. The boy was wasted and very ill from prolonged sepsis. An attempt at a radical operation for the cure of osteomyelitis was followed by a pathological fracture at the junction of the lower with the middle third of the femur.

The general condition of the patient was very poor, and permission was obtained to amputate the thigh, as a life-saving procedure. To obatin healthy flaps it would have been necessary to commence the operation in the middle of the thigh, and, if the upper fragment of the femur had been filed and trimmed in the orthodox fashion, the final stump would have been within an inch or two of the hip joint, an unmanageable position from the limb maker's point of view.

The usual circular incision was made at the knee joint, the knife passing *through* septic tissues and sinuses in the greater part of its course round the limb. In this case it was anticipated that there would be difficulty in securing the vessels in the septic and densely scarred tissues, and, in consequence, the popliteal artery was first exposed, ligatured, and divided near the opening in the adductor magnus. No tourniquet was employed. When the leg was removed, the lower end of the femur was held in a lion forceps, and extracted from the level of the pathological fracture. A few stitches were introduced in this case to bring the edges of the "sleeve" together, and a light gauze pack placed in position to ensure drainage.

The illustrations show rapid healing of the stump 2 months after operation (Fig. 7). There is no pain nor discomfort, and the general condition of the boy is completely changed.

The "sleeve" operation is suited particularly for cases of complicated fracture of the femur which are bad surgical risks. There is no division of bone with the saw, and there is a proportional diminution of shock. Furthermore, it is usually better to leave the "sleeve" completely open for drainage and contraction, a procedure which saves a considerable amount of time. In all three cases the operation was completed in about 15 minutes.

The operation is applicable to any position in the upper or lower limb, the general principles being the same.

Fig. 7. Amputation by sleeve method in a case of pathological fracture and osteomyelitis. The soft parts were divided through, not above, the septic area.

AMPUTATION OF THE LEG

In severe injuries and advanced disease where Symes' operation cannot be performed, the operation recommended by Orr in *Annals of Surgery*, November, 1921, has been performed in several cases in Mercer's Hospital with entire satisfaction.

The site of election for leg amputation is in the middle third. Long anterior and short posterior skin flaps are made. The deep fascia is included in the former. The posterior flap is made quite short, and a flap of fascia is fashioned from behind to turn over the cut end of the stump. The muscles are divided a couple of inches below the point of bone section, and the fibula is cut, as usual, at a higher level than the tibia. The periosteum at the cut end is carefully removed, and the marrow is scooped out with a spoon. The nerves, five in number, are drawn out of the stump as far as possible, and injected with absolute alcohol. The nerve is then divided just below the injected point. This prevents the formation of diffuse neuromata. Sometimes, as an alternative, the nerve is crushed and ligatured by the writer to prevent the growth and lawless distribution of neuromatous tissue.

Muscle flaps are not made, nor is the muscle permitted beyond the end of the bone more than 1 centimeter. Orr thinks that muscle produces an unstable stump which is likely to become chafed or tender. On the other hand, the muscles must not be allowed to retract, and they are fixed round the end of the tibia with a single purse-string suture of strong catgut. They are also fixed to the fascia, which is sutured over the bone.

The operation gives a firm, rounded stump with skin and fascia freely movable over the bone. The muscles have a new insertion at the end of the stump, which prevents their retraction and the exposure of the bone beneath the skin.

If it is necessary to amputate the leg at a higher level, it is a great advantage to remove the fibula *in toto*. Sir Robert Jones points out that, in this way, a piece of bone is removed which stands pressure badly, and, at the same time, the bulk of the stump is diminished so that a flap, which would otherwise be too small, may suffice.

A NEW AND RAPID METHOD OF BLOOD TRANSFUSION

Preliminary Report

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HAVING discovered that human blood, when sucked into the syringe with sodium iodide (Swan-Myers), does not clot immediately, I determined to try it out in a blood transfusion. This I did with complete success.

The method employed was this. I boiled a Luer syringe, and while the syringe was still hot drew into it ½ the contents of a 2-gram ampule of sodium iodide. Into this same syringe I withdrew from the donor 75 cubic centimeters of blood, shook the syringe rapidly in passing from donor to recipient, and inserting the syringe directly into the median basilic vein of recipient, injected its contents. This procedure I repeated immediately, using the remainder of my ampule of sodium iodide for the second injection. There was no clotting of the blood whatsoever, and no reaction from the procedure. It was accomplished in less than five minutes.

My method has the advantage over the sodium citrate method in that it requires no preparation save a sterile Luer syringe, a drop of iodine on the arm of donor and recipient, and a 2-gram ampule of sodium iodide. The blood is never exposed to the air, and the time necessary is reduced from half an hour to less than five minutes.

A HOCKEY-STICK INCISION FOR INGUINAL HERNIORRHAPHY

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Section on Surgery, Lexington Clinic

WITH the many incisions for the approach, and methods of repair for the cure of inguinal hernia already popularized by long usage in the hands of many operators, any new method or modification of known procedures must necessarily be offered with some trepidation.

The customary approach for the repair of an inguinal hernia, which is made through an incision slightly above and parallel to Poupart's ligament, gives satisfactory exposure in all cases and yet it is not infrequently difficult in adults, and more than occasionally impossible in infants to avoid contamination of the operative field. The lower third of the incision is through the dense hair follicles of the pubic region, where skin infection always lurks, and consequently the avoidance of wound infection from this source is occasionally difficult. A satisfactory method of dressing the ordinary inguinal incision, which will not only stay in place over the lower angle particularly, but is not tedious of application, has not been found applicable to all cases. The fold of the groin and the necessity of fastening the dressings over a mobile surface, like the upper part of the thigh, account in many instances for the displacement of the dressings through the loosening of the adhesive straps, incident to the patient's tossing about in bed. The double spica bandage reinforced by crinoline has been relegated to the past, and yet it was a most satisfactory dressing, except that it was time consuming and not economical. It has been replaced almost universally by a single gauze pad, held in place by adhesive straps. It has been found advantageous to supplement this with a suspensary in male patients.

The incision described here has distinct advantages, both from the standpoint of operative exposure and from the ease with which postoperative dressings may be applied safely and held in place. The line of incision, which is in the transverse diameter of the abdominal wall, is started in the mid-line of the abdomen at a point about three inches above Poupart's ligament. This brings the transverse arm of the incision through the skin, slightly above the pubic hair line in women, and in men through a thinning hair margin. This arm of the incision is carried out to the inguinal fold, meeting Poupart's ligament at an obtuse angle.

The upper arm continues in the fold of the groin upward toward the anterior superior spine of the ilium for a distance of two to three inches, but may be extended to any length to suit the

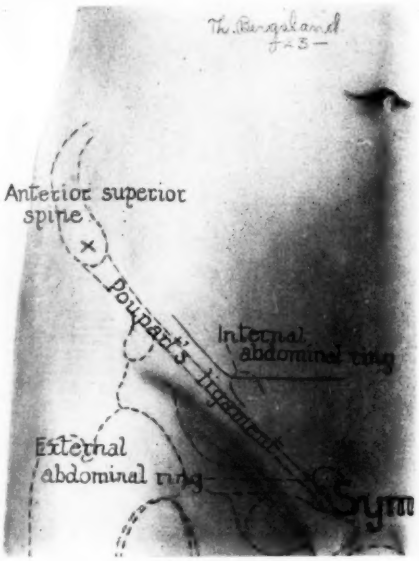

Fig. 1. Line of incision and prominent landmarks.

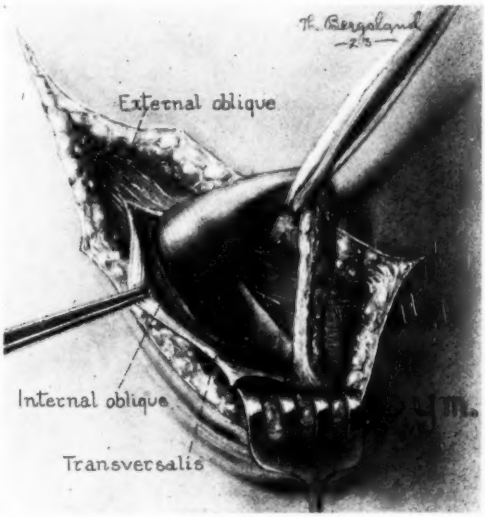

Fig. 2. Incision retracted showing internal and external rings.

convenience of the operator. It should be emphasized that there should be no sharp angulation where the two arms of the incision join, but a gentle curve which will insure quick healing. The incision is best made as a single line of incision and not as two distinct arms, the knife blade being carried in a curved direction upon meeting the inguinal fold and the incision continued upward to its termination.

The lower flap is now undermined downward toward the symphysis, and the spermatic cord is exposed emerging from the external abdominal ring. The upper flap needs little undermining, but is retracted out of the field of operation by an assistant. The structures of the inguinal region will thus be amply exposed and the herniorrhaphy may be carried out by any of the standardized procedures.

I have used this incision in a large series of cases which included practically all types of inguinal herniæ, and have found it most satisfactory from the standpoint of exposure. In infants it is especially adaptable since the dressings may be applied to a flat surface where they are easily held in place.

THE RESECTION OF THE TWELFTH RIB AS AN OPERATION FOR TOTAL EMPYEMA

By CARL NATHER, M.D., Vienna, and ALTON OCHSNER, A.B., M.D., Chicago
From the Surgical Clinic of the University of Zurich, Switzerland; Professor Clairmont, Director

A STUDENT of medical literature is struck with the number of various methods advised for the treatment of acute pleural empyema. The chief procedures advocated are repeated or continuous aspiration of the exudate, intercostal incision, and rib resection.

The experience of the United States Empyema Commission during the late influenza epidemic has shown that acute pleural empyema, especially the streptococcic variety, is divided into at least two stages. This fact is not only of diagnostic and pathological importance but also a knowledge of it is necessary for the proper treatment of the condition.

In the formative or early stage before the formation of adhesions the mediastinum is, as shown by Graham and Bell, freely movable. Therefore, only the conservative treatment as represented by aspiration should be used. Any radical procedure producing an open pneumothorax is very apt to result in that critical condition known as "mediastinal flutter."

As the case becomes more advanced and adhesions fixing the mediastinum are formed so that there is no longer the danger of a "mediastinal flutter," the most satisfactory treatment in the majority of cases is a radical one. However, there are some cases in which empyema may be successfully treated conservatively, i.e. by aspiration and the use of antiseptic solutions. (Mozingo, Moszkowicz, Davis, Major, Phillips, Delbet and Girode, Reinhart and Oelgoetz, Ramsohoff, Aschner, and Beust.)

In those cases in which conservative treatment has been tried and has failed, radical treatment must be resorted to before the condition becomes chronic.

Among the operative procedures are two principal methods: 1. Radical intercostal incision. The exudate is in one sitting completely evacuated, the fibrin is removed and the wound closed. (Lilienthal Whittemore, Hathaway.) Of great advantage with this method is the use of a differential pressure apparatus like that employed extensively in the European clinics (Ueberdruck); or insufflation during the operation and at the subsequent dressings (Sauerbruch, Jehn, and Odermatt). 2. The most popular operation, and as a rule the one of choice, is the drainage of an empyema by means of the resection of one or more ribs. The site of the rib resection has been a much disputed question. From the literature it appears that the seventh, eighth, and ninth are the ribs usually resected (Rodman, McGlannan, Eggers, Hollenbach, Tuffier, and Beust). However, resection has been advocated of practically every rib of the thorax from the fourth to the eleventh. It is self-evident that in those cases of encapsulated empyema the resection should be done at a point where the best drainage can be obtained. This point is always at the most dependent portion of the abscess cavity. This fact holds good not only for the encapsulated but also for the total empyemata with which we wish to deal.

In spite of the fact that by far the greater majority of authors agree that a pleural empyema should be drained in its most dependent portion, there is a great difference of opinion as to where this point lies after evacuation of the pus. According to the different authors the point varies from the level of the sixth to the eleventh rib.

This lack of uniformity is easily understood when one considers the number of factors which may effect the position of the diaphragm in cases of empyema. Among the most important are the amount of the exudate, the intra-abdominal pressure and the condition of the diaphragm. While it is true that in an exceptional case the diaphragm may ascend to the level of the sixth rib and in other cases somewhat lower, there is only one point at which a complete pleural empyema can be drained at its most dependent portion. This point lies in the lowermost portion of the pleural cavity which is the costophrenic angle.

Therefore, to insure sufficient drainage in *all* cases of complete empyema it is advantageous to drain at this point. Barjin was able to show roentgenologically that in these cases the diaphragmatic excursion is considerably less than that on the unaffected side and that there is a flattening of the diaphragm which continues after the evacuation of the pus.

Davis on the other hand found that the diaphragm is located at a higher level.

This lack of agreement between the various authors merely emphasizes how very difficult it is to determine the position of the diaphragm. This is especially true in cases of right-sided em-

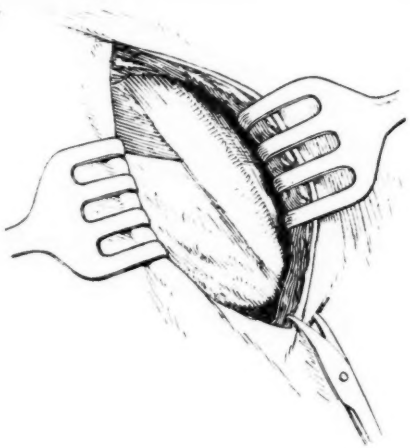

Fig. 1. Operative wound after resection of the twelfth rib. The bed of the twelfth rib traverses the wound obliquely. In the upper part of the wound can be seen the lowermost portion of the parietal pleura.

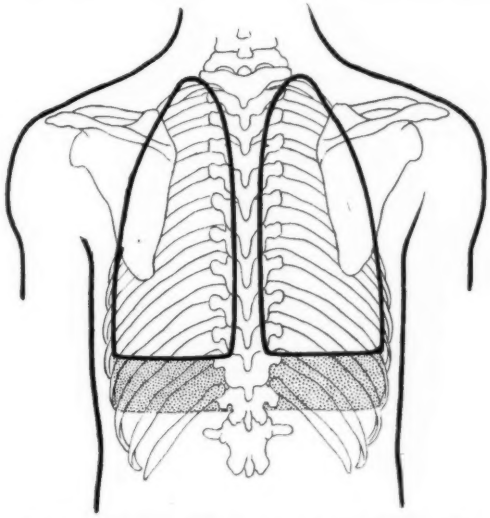

Fig. 2. Diagram showing the relation between the pleura and the twelfth rib.

pyema where the shadow produced by the exudate joins that of the liver.

Therefore before drainage is instituted in cases of total right-sided pleural empyema, it is clinically and radiologically impossible to determine the position of the diaphragm or to predict what position it will assume after evacuation of the exudate. It is then impossible before the operation to make out the location of the most dependent point. X-ray studies, before and after operation, in the cases of empyema treated in the Surgical Clinic in Zurich show a variable position of the diaphragm even in those cases in which it is possible to visualize the diaphragm.

While it is indeed probable that in the majority of cases of empyema, after evacuation of the pus, the diaphragm assumes a higher level, because of our inability to determine beforehand the amount of ascension, it is always safest and best to drain at the most dependent portion of the *thorax*.

In selecting a point at which any cavity can be drained best, one should determine the most dependent portion of the cavity by a fixed wall and not by a movable one. In the case of the thorax this most dependent portion is in the costophrenic angle in the region of the twelfth rib. (In a previous article on subphrenic abscess we mentioned the possibility of an empyema drainage by resection of the twelfth rib.)

The drainage of empyema in the costophrenic angle has been advocated by Ashhurst, Bérard and Dunet, and Chevrier but we have been unable to find any mention in literature of treatment of empyema by resection of the twelfth rib alone.

Ashhurst mentions that sometimes it is advisable to resect the twelfth rib in combination with resection of the tenth and eleventh.

Chevrier emphasizes the fact that the deepest point in the thorax is in the costophrenic angle posteriorly near the vertebral column. He was able to show on cadavers that resection of any rib above this point resulted in retention.

The variation in the position of the movable wall of the thorax, the diaphragm, must be compensated for by some special mechanical means. We fulfil this requirement in our operation as shown in the following technique.

TECHNIQUE

Local anæsthesia. (½ per cent novocain-adrenalin. ½ cubic centimeter 1:1000 adrenalin to 100 cubic centimeters.) Infiltration over the twelfth rib and conduction anæsthesia of the ninth, tenth, eleventh, and twelfth intercostal nerves on the affected side.

The patient lies in the semi-sitting posture and reclines toward the healthy side. Incision is made over and down to the twelfth rib. The erector spinæ muscle mass is only partially incised, the unincised portion is retracted medially.

Subperiosteal resection is made of the *entire* twelfth rib. The upper margin of the wound is

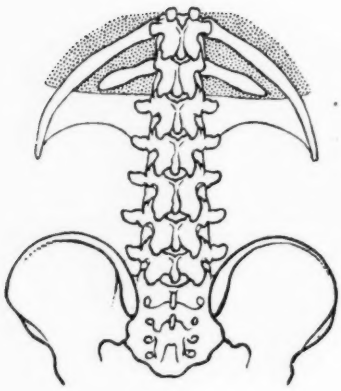

Fig. 3.

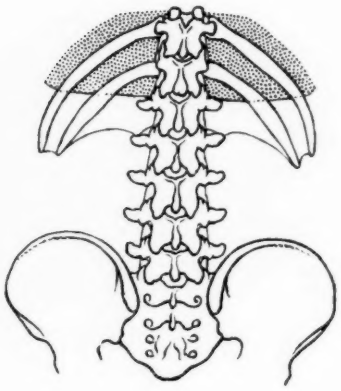

Fig. 4.

Fig. 5.

Figs. 3 and 4. Schematic drawing showing how the relation between the twelfth rib and the pleura varies with the length of the twelfth rib.

Fig. 5. Diagram showing the complete drainage of the pleural cavity obtained by means of the fenestrated rubber tubes, independent of the position of the diaphragm.

elevated by blunt, broad retractors. This brings into view the costophrenic angle between the eleventh rib and the vertical column. See Figure 1. (Figs. 2, 3, and 4 show the relation between the twelfth rib and pleura in cases of different rib length.) In cases of total empyema the pleura instead of appearing as a smooth, glistening, normal membrane is thickened, œdematous, and infiltrated.

Exploratory puncture is made by means of a needle inserted in the costophrenic angle which by continuous aspiration is advanced *perpendicularly* along the thoracic wall. The perpendicular position of the exploratory needle is important in order to avoid an injury to the diaphragm.

If pus is obtained, the parietal pleura at the point of insertion of the needle is *transversely* incised. In those cases in which the costophrenic angle is not obliterated, this procedure is sufficient to secure evacuation of the pleural contents. However in case the parietal and visceral layers of the pleura in this region are adherent the adhesions, when fresh, are loosened by means of a blunt periosteal elevator up to the free cavity.

If, by the exploratory puncture, no pus is obtained and the costophrenic angle is obliterated by old, dense adhesions the costal pleura is bluntly loosened from the thoracic wall upward for a short distance. This is easily accomplished especially in cases of empyema because of the œdema. The exploratory needle is then introduced into the pleural cavity at the highest point of separation of the parietal pleura from the thoracic wall. Upon obtaining pus, the pleura is incised along the needle.

A small incision is made for three reasons:

1. The exudate can be gradually removed without producing shock.

2. In those exceptional cases where the operation is performed in the early or formative stage before the mediastinum becomes fixed, the danger of a "mediastinal flutter" caused by a large open pneumothorax is avoided.

3. By means of large drainage tubes all cases of total empyema can be completely drained.

The removal of fibrin masses, as advocated by a number of authors, we disapprove of as these substances serve as adhesives to unite the two pleural layers and thus assist in obliterating the cavity after evacuation of the pus.

After the gradual removal of the exudate the cavity is explored by means of a pair of large curved forceps. In this manner it is possible to open any encapsulated abscess which might coexist and also determine the extent of the empyema cavity. Before insertion of the drainage

Fig. 6. Roentgenogram of the chest demonstrating the position of the drainage tubes before shortening.

tubes the patient is leaned toward the affected side so as to drain off all the exudate.

Two large thick rubber drainage tubes with numerous lateral holes are inserted up to the apex of the cavity. By means of these tubes with their numerous lateral openings we obtain complete drainage of the pleural cavity independently of the position of the diaphragm (Fig. 5). A large safety pin is inserted into each tube at the skin level and that portion of the tube distal to the pin is cut away to prevent any pressure on the tubes from the dressings. The tubes are fastened by means of long, narrow strips of adhesive plaster over the safety pins. The wound is superficially tamponaded with iodoform gauze. The patient is placed in a sitting position in bed and inclined somewhat toward the affected side.

POSTOPERATIVE TREATMENT

Daily dressings are necessary because of the profuse drainage during the first few days after operation. However, because of the small size of the wound and its location, the dressings are practically painless and not unpleasant.

According to the general condition, the drains are shortened within the first 3 days. In this way we prevent with certainty the formation of a lung decubitus. The shortening is facilitated when done under the control of the fluoroscope. It is possible to see exactly how much the tube must be removed to allow the end to project just above the dome of the diaphragm (Figs. 6 and 7).

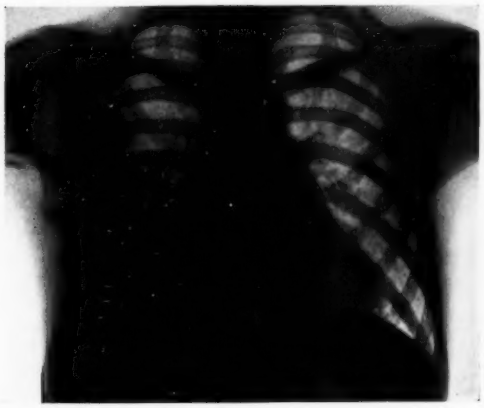

Fig. 7. Roentgenogram after the partial withdrawal of the drains. The ends of the drains project above the dome of the diaphragm.

In case a portable fluoroscopic apparatus is not accessible, a simple X-ray picture will give a very good idea of how much the drain must be shortened to obtain the desired result.

After the shortening of the drains, light breathing exercises are begun. Any one of a number of contrivances may be used to assist in the re-expansion of the lung. The two water bottle system, described in the American literature, is satisfactory.

The amount of drainage, the general condition of the patient, and the temperature curve are dependent upon the subsidence of the lung process. The temperature which falls somewhat after the drainage of the empyema gradually becomes normal. As soon as this point is reached one drain is completely removed. After several days, depending upon the amount of drainage, the second drain is removed and replaced by another of the same length but of a smaller caliber.

When the cavity becomes obliterated by the expansion of the lung, shown roentgenologically, the secretion practically disappears, and the temperature remains normal, the tube is either clamped or corked. If the temperature still remains normal and after 2 to 3 days there is no retention, the tube is completely removed. The wound closes then within 3 to 4 days.

DISCUSSION

The drainage of a total empyema must be considered from a physical, anatomical, and physiological standpoint.

Physically, the cavity should be drained in its most dependent portion.

Anatomically, this is best accomplished in the costophrenic angle posteriorly by resection of the twelfth rib.

Physiologically one most consider, theoretically at least, an active element produced by the movement of the lung. Delbet and Girode and Fitzwilliams consider the physiological factor as the most important one in the drainage of an empyema. They believe that the drainage should be done at that portion of the thorax where the lung expansion is greatest and not at the most dependent portion of the pleural cavity. According to their theory the lung acts as the piston of a syringe and literally forces the pus out of the thoracic cavity.

We disagree with these authors and believe that the physiological factor in the drainage of a pleural empyema can be to a great extent disregarded. A pathological lung such as exists in the presence of an empyema, cannot expand as a normal lung would and naturally cannot be of much assistance in the evacuation of the exudate.

The anatomical and physical factors are therefore more important in the drainage of an empyema than the physiological.

The exudate by virtue of its weight seeks the lowest level which in the case of a pleural empyema varies considerably. Because of this variation and the impossibility of predicting preoperatively the position of the lowest point of the empyema cavity after the evacuation of the exudate, it is always safest to drain at the most dependent portion of the *pleural cavity*. Anatomically this point is located in the region of the twelfth rib.

By drainage of an empyema with resection of ribs, other than the twelfth, there is the possibility of a space existing below the site of drainage, in which the pus is retained.

The resection of the twelfth rib, in contrast to the partial resection of other ribs, produces a wound composed only of soft parts. This characteristic does away with one of the important causes of the development of a permanent fistula, because as soon as the drainage tubes are removed the wound edges fall together and obliterate the drainage canal.

In those cases where a portion of one or two ribs has been resected, the presence of the ribs produces a wound, which in itself has a tendency to remain open, because of the inelasticity of its walls. This condition is indeed an advantage as long as the infection is present and there is any drainage. It is however a decided disadvantage as soon as the infection has cleared up and a healing of the wound is desired.

By resection of the twelfth rib we attain the ideal. While an infection exists we obtain complete drainage of the cavity by means of large, heavy, fenestrated rubber tubes. After cessation of all drainage and subsidence of the infection we remove our artificially produced splinting of the wound and secure an immediate closure. We are thus able to shorten the convalescence considerably. We can avoid absolutely the formation of a rest abscess by the simple procedure of clamping the drainage tube for a day or so before its removal, to determine whether or not all infection has subsided.

By the partial resection of any rib in the presence of an infection such as empyema, there often results an osteomyelitis of the remaining portions of the rib. This condition, judging from the literature, is the cause of the formation of a chronic empyema in a large number of cases (Moschcowitz, Wilensky, Butler, Flagg and Haverstock Schochet, and Eggers).

By resection of the twelfth rib *in toto* we prevent this complication and eliminate one important cause of the production of a chronic empyema.

Within the last year we have used this methd of treatment in all the cases of total empyema admitted to the Surgical Clinic in Zurich. Our results have been much more satisfactory in this series of cases than in those treated by partial resection of other ribs. We have been able to obtain complete drainage in all cases and have shortened the convalescence considerably. The average time taken for the complete healing of the wound was 4½ weeks.

CONCLUSIONS

1. Drainage of a pleural empyema at the anatomically most dependent portion is the method of choice. The physical and anatomical factors in drainage are more important than the physiological.

2. The position of the diaphragm in cases of empyema varies considerably before and after operation. Pre-operatively it is impossible to determine what position the diaphragm will assume after the evacuation of the exudate. Therefore it is safest always to drain at the most dependent portion of the *pleural* cavity.

3. The resection of the twelfth rib allows access to the pleural cavity at its anatomically most dependent portion.

4. A small pleural incision prevents the production of a large open pneumothorax. In those

cases operated upon in the formative stage of the empyema before the mediastinum is fixed, there is no danger of a resulting "mediastinal flutter."

5. By means of large, heavy, rubber drainage tubes with numerous lateral openings the pleural cavity can be completely drained independent of the position of the diaphragm.

6. Cases of empyema treated by resection of the twelfth rib have a shorter convalescence.

7. The formation of a chronic fistula is practically impossible because as soon as the infection has cleared up and the drainage tubes are removed the walls of the wound fall together. On the other hand partial resection of a rib produces a splinted wound the tendency of which is to remain open.

8. Total resection of a rib does away with the possibility of a resulting osteomyelitis of the rib and therefore one factor in the formation of a chronic empyema is eliminated.

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END-RESULTS OF A NEW "UTERINE SHELF" OPERATION FOR THE RELIEF OF CYSTOCELE

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At the first meeting of the New England Surgical Society, held in Boston in October, 1916, I presented a paper descriptive of a new method for the surgical relief of cystocele. The procedure, which is very simple, both in principle and application, consists of employing the uterus as a support for the protruding bladder very much in the same way as it is utilized in the "interposition" operation, but with this difference, that instead of turning the uterus upside down, with its fundus underneath the urethra, that organ is retained in very nearly normal position, the cervix being sutured firmly to the triangular ligament at the point at which the latter lies just below the external meatus. When secured in this position the uterus acts precisely as a shelf upon which the bladder rests, and the procedure might well be called the "uterine shelf" operation.

When this paper was read 8 cases had been operated upon; by the time it was published this number had been increased to 16. A few of my colleagues and I have used the method something over sixty times. Believing that a sufficient time has now elapsed to permit of definite conclusions as to the surgical and clinical results, I have recently collated the statistics in as many of the cases as could be traced. The number from whom replies have been received, or who have been seen personally, is 40. Before giving the detailed results of this inquiry I will describe the operation briefly and make some remarks as to the type of cases to which it seems especially applicable and also give certain points of technique which have been developed.

The first time the operation was performed was largely a matter of chance. It was done on the spur of the moment and without any intent of establishing a new operative procedure. It happened in this way: Some 10 or 12 years ago while performing the standard plastic operation for the relief of a large protruding cystocele, after the

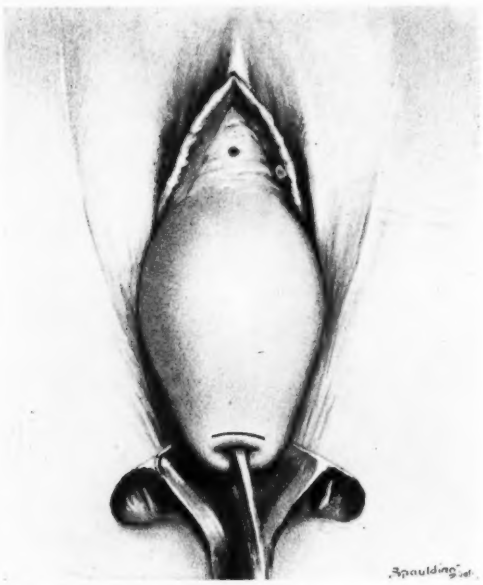

Fig. 1. Shows incision when cervix is not amputated. It should be down over the curve, the closer to the os the better.

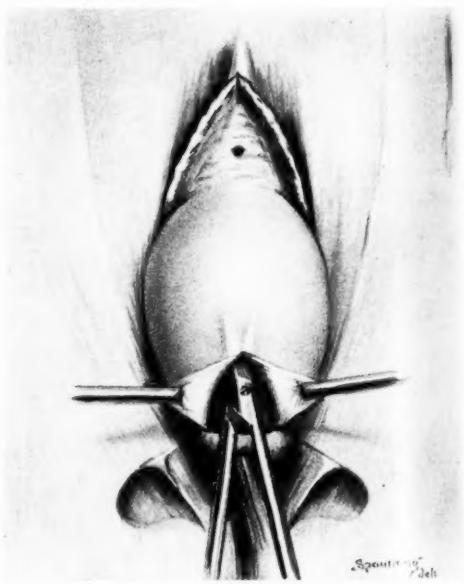

Fig. 2. Dissection of flaps from bladder. The points of the scissors are pushed upward and forward to come close to the surface being directed away from the bladder.

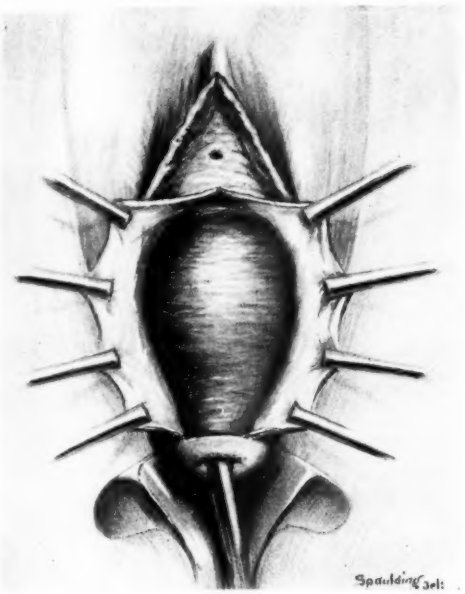

Fig. 3. Dissection completed. If carried too far to the side troublesome bleeding may follow. The lower edge of the triangular ligament is shown at upper limit of dissection. This lies close to the surface and should be developed by careful knife dissection. It should have been placed somewhat nearer the meatus than it is in the cut.

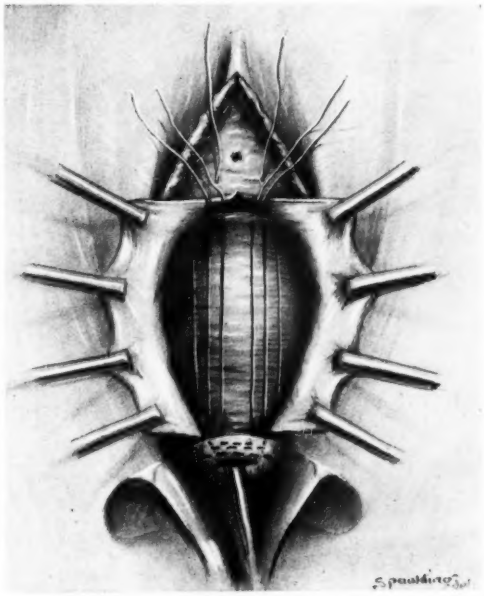

Fig. 4. Sutures in place. The two buried sutures, to be tied later above the triangular ligament, are of chromic catgut. The suture which emerges through the mucous membrane and is to be tied just below the meatus is of silkworm gut. It is usually allowed to remain for several weeks.

vaginal mucous membrane had been dissected off, I was about to introduce the usual series of interrupted sutures running from side to side when I happened to lift the cervix upward toward the meatus and remarked to the surgeon who was assisting me: "What do you think would be the result if the sutures were put in up and down instead of crosswise, suturing the cervix close up underneath the meatus?" This was done. I found a goodly amount of tough fibrous tissue below the meatus which seemed to afford a good bite for the suture. My chief fear at the time was that the weight of the uterus with the pressure of the bladder above it might affect the urethra and cause some difficulty in micturition. The result of this first case proved entirely satisfactory. The cystocele did not recur and there were no urinary or bladder symptoms whatever.

This case had passed entirely out of my mind when, a number of years later, I was asked by a physician in a neighboring town whether something could not be done to relieve a patient who had had her uterus fixed to the abdominal wall, but whose cystocele, a very troublesome one, had not been cured. When she asked her operator, a prominent Boston surgeon, if further relief could be had, he replied that he had done all that was possible for her comfort. She was 79 years old and under ordinary conditions probably might have been fairly comfortable as she was, but she had to care for and lift an invalid husband, and the bladder tumor was a serious inconvenience to say the least. On examination I found the uterus in excellent position with the fundus securely anchored to the abdominal wall, but there was a large protruding cystocele. The result in my first case then came to mind and I suggested that this seemed an ideal case for such a method of suture. The operation was performed and the symptomatic relief was perfect. To use her own words: "I never would know I had a bladder." She was able to care for her husband as long as he lived and her own relief continued, I am informed, up to the time of her death some years later.

From that time down to the present I have used this method in practically all cases of cystocele whether or not associated with other varieties of prolapse. After a number of operations had been performed I made a more careful dissection of the tissues beneath the meatus into

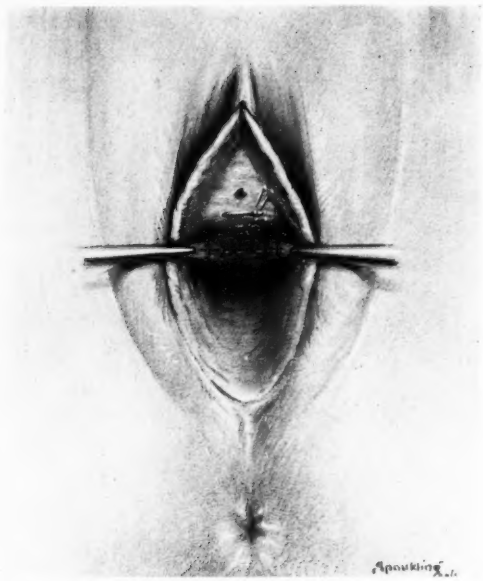

Fig. 5. Somewhat diagrammatic. The flaps, after being trimmed, are grasped at their mid-point, pulled out laterally, and interrupted catgut sutures applied. A few transverse sutures are placed at upper and lower ends of wound.

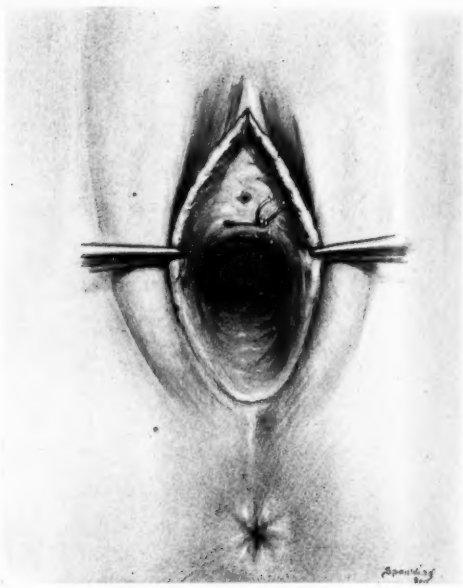

Fig. 6. Sutures tied and uterus lifted up behind pubes. In this cut two silk-worm gut sutures are shown. At the present time only one is generally used, as there seems no need of greater support.

which the sutures supporting the cervix had been placed, and discovered that I was employing the dense fibrous layer of the triangular ligament which passes below the urethra and then spreads out fanwise to each pubic bone. I now dissect out this ligament in each case. It is extremely dense and firm and when grasped by the forceps it is almost possible to move the patient by making traction upon it and that without disturbing in the least the meatus or the urethra.[1] Of course this explains the absence of any interference with micturition while at the same time it affords an extremely firm anchorage for the cervix. If once the uterus becomes firmly adherent at this point it is safe to say that the uterine "shelf" will not give way. As a matter of fact there has not been a single case where the cystocele has recurred, at least so far as I have learned. In two cases there was an imperfect union at this point: one due to an old rotten suture and the second resulting from a constitutional condition of the patient. However, I think it proper to say that these do not affect the validity of the method as such. One of the cases just mentioned had a second operation which was successful, while the other was so much relieved that she declined further interference.

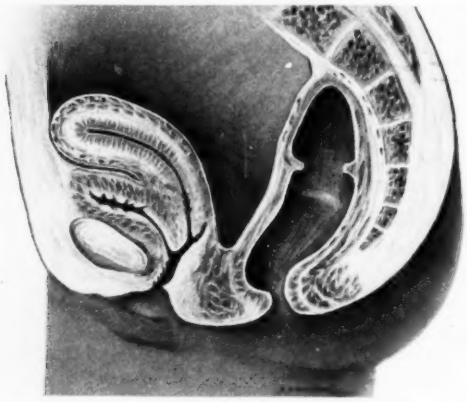

Fig. 7. Section showing uterus anchored to abdominal wall. Anterior lip of cervix is attached close to meatus, lifting bladder, and obliterating the anterior cul-de-sac of vagina. Proportions are not exact and the position is somewhat exaggerated to show lifting effect.

[1] The triangular ligament in the female has received scant attention in the textbooks on anatomy. It has been given but a sentence or two of description and I have nowhere seen an adequate illustration showing its shape and relations.

In my former paper I restricted the probable utility of the operation to those cases, especially, in which the uterus had been fixed or suspended previously and in which there was no great amount of procidentia. As a matter of practice, however, I have gradually learned that these restrictions are more or less unnecessary. Naturally the best results, surgically speaking, have been those in which the uterus either had previously been fastened up or was fixed at the time of operation. However, in a considerable number of cases, where it seemed unwise to open the abdomen, the result, as far as the cystocele was concerned, has been entirely satisfactory. Of course the presence of a rectocele, which either was not entirely cured at the operation or which developed later on, gave a certain amount of trouble. However, I have seen no special tendency for the secondary formation of a rectocele, so that the presence of such a condition does not affect the standing of the new operation as a means of relieving the vesical prolapse or hernia.

Two patients reported that there seemed to be something wrong at the site of the operation and they feared the sutures had given way. Examination in one of them showed that what the patient felt was a very long anterior lip of the cervix. It gave no discomfort, however, and she declined to have it shortened. In the other case I did not cut away as much of the mucous membrane flaps as usual and after some months they had not retracted as they commonly do in the process of healing but hung down like dogs' ears. The patient had no symptoms, but could feel these projections when bathing. They were removed easily under local anæsthesia and the patient is happy once more.

In one case, I myself thought at first that the conditions had recurred, but on careful examination found the uterus still adherent to the abdominal wall and the bladder still completely held up. A soft elastic tumor in the vagina proved to be a true hernia which passed through a finger-sized opening between the rectum and the uterus and completely filled the vagina. It was tied off at the base, by the vaginal route, but there was no dense structure for the sutures. In less than a year the hernia had recurred, and this time I opened the abdomen and made a sort of second floor to the pelvis—a kind of double keel, as it were—by suturing the cæcum and sigmoid together and both of these organs to the front wall of the pelvis just above the bladder. This expedient, which so far as I know is a novel one, was suggested by the writings of Culbertson, of Chicago, who utilizes these portions of the bowel to cover large exposed surfaces in the pelvis. This final operation was done several years ago and the new floor, while somewhat soft and elastic, has so far held up the overlying intestines.

I have recently seen one case that is quite instructive. The "shelf" operation was done 7 years ago in a very heavy woman of about 65 who had complete procidentia, and who had an extreme amount of abdominal and omental fat. She was doing heavy work with much climbing of stairs. A surgeon to whom she went a few months ago during my illness tells me that there was a large secondary abdominal hernia and that the cervix projected downward between the labia. Either the uterus, he thought, had broken away from its attachment or was held only by a stretched out band. He was of the opinion that the uterus had also broken away from the bladder. He proposed a vaginal hysterectomy. I was present at the operation which was done about 4 months ago. The greater part of the projecting mass consisted of a very large rectocele with relaxation of the whole pelvic floor, but the interesting point is that the cystocele had never recurred. In fact the whole anterior surface of the uterus was so firmly attached to the bladder that they were separated with considerable difficulty. Just what is the best thing to do under such conditions is a matter of opinion.[1] At any rate the cystocele had been cured. She had been entirely comfortable for three years following her operation.

In one case a rather unusual problem presented itself. The patient had a marked cystocele but there was present a large uterus with multiple fibroids which evidently called for hysterectomy. I first did a supravaginal hysterectomy, then attached the cervix of the remaining stump to the triangular ligament in the usual way, and finally implanted the round ligaments, shortened as much as possible, into the stump. This manœuver obliterated the cystocele completely and the patient was permanently relieved.

Naturally all my operations have been done on patients who had passed the childbearing period. One would hardly dare to fix the cervix in this manner in an individual who might become pregnant, and yet on thinking the matter over I am inclined to believe that such a uterus might go through to term and empty itself without undue risk to mother or child. I shall not tempt fate by arranging such an affair but should such an unexpected pregnancy occur, I should allow it to go on with a good hope of a successful termination.

[1] This would seem to be just the case for the modified technique suggested by Dr. Cotton of Boston. See addendum at the end of paper.

Now a few words as to the technique of the operation. The posterior lip of the cervix is grasped by a volsellum and the denudation is begun close down to the os—the closer the better. If the cervix is infected, much thickened, or a very long one, I always amputate it. The mucous membrane is separated from the badder by dissecting scissors. Some operators think that there is danger of perforating the bladder by this splitting technique, but if the tip of the scissors is kept pointed away from the bladder and close to the surface of the vaginal mucous membrane, this could hardly happen. After pushing the scissors upward for an inch or so the flap is cut by the scissors in a line joining the cervix to the meatus. When we reach a point about an inch below the meatus, care should be taken to avoid cutting the triangular ligament. The flaps are dissected from the bladder wall laterally by sponge dissection as far as seems desirable. In my earlier operations I carried this dissection farther to the side than I do now. The change was made for two reasons: In the first place, experience has shown that it is unnecessary to make a very broad denudation, and besides, the farther one gets laterally the greater is the number of large veins he is apt to encounter which may be torn causing troublesome bleeding. The excess amount of flap is then cut away on each side. How much shall be removed is a matter of judgment. Usually the flaps retract into the vagina as healing goes on, and cause no trouble; but in one case, as I have just reported, I left so much tissue that it bothered the patient and it was removed.

The sutures are started by passing a No. 2 or No. 3 chromic catgut from above downward through the triangular ligament, then through the cervical tissue transversely close down to the os and again through the ligament from below upward. I usually put in two such sutures. Very likely these alone would be sufficient to hold the tissues in place until firmly adherent, but I never have trusted to the catgut alone except in the one instance already reported in which it was the only suture material at hand. Unfortunately it proved to be quite rotten and gave way within 24 hours. I next place one or two sutures of silkworm gut, starting in this case just below and to one side of the meatus, but this time going through the mucous membrane so that the knots after they are tied will be accessible. It will be seen that the catgut sutures are buried, while the silkworm comes to the surface just below the meatus. The ends of the silkworm are cut long and rarely cause any irritation. I have usually sent the patient home with these sutures in place and have had her come back for their removal from 6 to 8 weeks afterward. So long a time may be unnecessary, but, at least, it is a safeguard against possible early separation at the line of suture.

The flaps are now trimmed, if this has not already been done, and interrupted chromic catgut sutures applied. This line of suture runs transversely to the axis of the vagina. In most cases I have found it necessary to do a very thorough plastic operation on the perineum and frequently an associated rectocele requires special attention. A strip of iodoform gauze is left in the vagina, after which the abdomen is opened if it is a case of uterine fixation.

I will not give an account of the individual patients as their symptoms were much alike, but will simply summarize the results obtained.

The ages of the patients traced ranged from 43 to 79 with an average of about 68 years. The length of time during which patients have suffered ran from 1 to 45 years: an average of 10 years. Thirty-six (90 per cent) reported themselves entirely well. Two stated that they were relieved. Two reported that they had found no relief. (Neither of those latter returned for examination and the reason why their symptoms persist is unknown. Their persistent discomfort may have been caused by some other condition than the cystocele, but I give them the benefit of the doubt.) We have then symptomatic cure in 90 per cent of the cases: symptomatic relief in 95 per cent; no relief in 5 per cent. There was no mortality.

So much has been said during the past few years of the importance of following up cases to distinguish between what may be called anatomical or surgical cure, and symptomatic cure or absence of symptoms, that I will quote a few of the statements voluntarily made in the reports received to show how satisfactory the results have been, at least in selected cases. Some statements were so enthusiastic that they sound like a patent medicine advertisement, and I forbear to reproduce them.

Mrs. W. who had suffered fourteen years and who had had to wear a support constantly says: "No trouble at all now. . . . Feel fine all the time."

Mrs. B., troubled for 5 years: "I have all kinds of relief and have not been troubled since operation."

Mrs. P.: "Was in very bad condition," . . . "Consider myself as well as I ever was."

Mrs. P. had been troubled 45 years, caused, she thinks, from jumping rope while a child. She says: "Nearly entirely well except when on my feet a great deal of the time and then nothing to speak of." She had some symptoms after a 250 mile auto ride but speedily recovered and considers herself "a well woman."

Mrs. T., 20 years duration: "Can now work or walk without getting much tired and have no backache whatever."

Mrs. S. Just before operation could not be on her feet. "Now able to do all my housework and walk around with all comfort."

Mrs. B., 15 years. "Complete relief."

Mrs. M. B. wore support for 12 years. Seventy-six years old at operation. "Now perfectly well."

CONCLUSIONS

From my observations of these cases and the results reported, I think we may conclude:

1. That the operation as described is a safe one.

2. That the bladder, supported by the uterus as a shelf, is permanently retained in its corrected position.

3. That the symptoms, whether due to the dragging down or to the irritation of the bladder, are completely relieved in at least 95 per cent of the cases.

4. That the best results are obtained, as would naturally be supposed, when the uterus is supported by some sort of intra-abdominal operation.

5. That a thorough repair of a torn or relaxed perineum and any complicating rectocele is quite essential.

6. That a large measure of relief can be expected even in those cases in which the condition of the patient does not warrant opening the abdomen.

7. That the fixation of the uterus as described not only does not in itself produce any discomfort, but many patients have an unexpected feeling of well being.

8. That advanced age seems no bar to the operation.

Addendum. Since the above paper was presented, Dr. Fred C. Cotton, of Boston, in a personal communication has described an interesting and valuable modification of the operation as described. By his permission a brief outline of his case is given here. The patient, an elderly woman, presented a very large globular cystocele behind which was nearly hidden a very small cervix. The uterus, much atrophied, was stretched out to the length of nearly 6 inches. After denuding the cystocele in the manner already described, he did a vaginal hysterectomy and after sewing the edges of the broad ligaments together he brought the upper edge of the ligament, now united into a single band, down under the cystocele and attached it securely to the triangular ligament. The flaps dissected from the cystocele were now sutured in place with little or no trimming to form the anterior vaginal wall. The result anatomically was entirely satisfactory and the relief complete. By this technique the broad ligament becomes a real "shelf" upon which the bladder rests. Should further experience confirm the good result obtained in this case, as I believe it will, this would seem to be the ideal operation especially adapted for those cases in which the uterus is the seat of pathology or in which it seems unwise for whatever reason to open the abdomen above the pubes.

A HYDROSTATIC REPOSITOR FOR PROLAPSE OF THE UMBILICAL CORD[1]

By DAVID MONASH, M.D., F.A.C.S., Chicago
Attending Obstetrician, Chicago Lying-In Hospital

ABOUT a year ago I had an urgent request to see a patient who had a prolapse of the cord and was in the first stage of labor. The cervix was well effaced and dilated to 4 or 5 centimeters. A loop of the pulsating cord was lying below the head. The patient had been placed in the usual knee-chest position which had been maintained for three-quarters of an hour. After a thorough aseptic preparation an attempt at manual reposition was made. In the inverted position the head receded allowing the introduction of the fingers and the cord was carried well above the danger zone of compression by the head. As the fingers were withdrawn the head was supported and pressed into the lower uterine segment, the patient at the same time assuming the elevated lateroprone position. It was soon evident from the fetal heart sounds that our apparently successful reposition had not succeeded. Vaginal examination showed a fresh prolapse. A second attempt to return the cord and loop it over a projecting small part failed. At the moment no instruments for reposition were obtainable. After manual dilatation of the cervix the hand was introduced and version followed by immediate extraction relieved the patient and rescued the child from impending danger. The cervix was torn, the child had to be resuscitated. During that hour of anxiety, effort, and failure, both the attending physician and I felt keenly the great need at hand of some simple and efficient means of reposition and retention of the prolapsed cord when the accident occurs in the first stage of labor.

After this experience I determined to study the subject of reposition and the causes of prolapse of the cord after reposition by the various instrumental and manual means as they obtain today. A critical survey of the literature on this subject presents a dreary chapter of identical effort and experience among obstetricians in many countries with practically no advance in diminishing the high fetal mortality that still accompanies this accident.

All authorities stress the high fetal mortality in cord prolapse particularly in the first stage of labor, estimated by some as high as 80 per cent in the untreated cases while in those cases where operations are undertaken to rescue the child the fetal mortality is reduced to 40 or 50 per cent. "Prolapse of the umbilical cord" says Williams, "must be regarded as one of the most frequent causes of fetal death in spontaneous labor in contracted pelves." Hirst states that "danger to the mother lies in the operative procedures which are often required for the reposition of the cord such as version and rapid extraction."

In a case of air embolism reported at a recent meeting of the Chicago Gynecological Society the mother's death followed reposition of the prolapsed cord by the accoucheur's hand.

The prognosis for the child is determined by many conditions, the stage of labor, the fetal presentation and position, the degree of cervical dilatation, the amount of cord prolapsed and the gravity of the abnormality causing the prolapse. The risk to the child is increased in head presentation, contracted pelvis, undilated cervix and primiparity. Prolapse in itself does not affect the mother but the treatment instituted to rescue the baby may endanger the mother through trauma, sepsis, hæmorrhage and air embolism. With successful reposition and retention of the cord in the uterine cavity the immediate indication is satisfied and the subsequent conduct of the labor is manifestly that indicated before the prolapse occurred. The one indication for treatment is to relieve the cord from pressure. The treatment instituted is dependent in a large measure upon the condition of the cervix. Prolapse during the first stage of labor yields the larger percentage of fetal deaths. Either by gravity—postural treatment, knee-chest, Trendelenburg or elevated Sims—by hand or instrument the cord must be placed above the zone of compression. Reposition by all of these methods is more or less difficult to effect and frequently disappointing. The literature records much ingenuity displayed in the various contrivances and instruments hurriedly improvised to meet the emergency. The list includes a piece of sponge, folds of gauze, an inflated rubber pessary, a rod of gutta-percha, a piece of whalebone drilled with holes to which the cord is attached and many types of metal instruments more or less dangerous have been invented and discarded. While the textbooks are replete with the oft repeated advice to make a repositor out of a catheter and

[1] Presented before the Chicago Gynecological Society, January 18, 1924. For discussion, see p. 119.

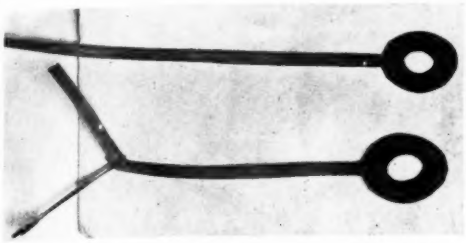

Fig. 1. Photograph of the instrument, collapsed and distended.

stilette, as of the Braun type, there is not a cord repositor at present in any armamentarium that I have had occasion to investigate in any of the most modernly equipped maternity hospitals in Chicago, nor is there any other instrument provided for the emergency. Indeed the proper type of catheter or bougie and stilette is not easily obtainable nor is the knowledge of assembling the parts and their use as a repositor at hand.

The requirements for a self-retaining repositor are that it should easily and safely engage the cord, be easy of introduction, be retained with the cord above the presenting part and not interfere with the engagement of the head and spontaneous labor.

Description of the repositor (Fig. 1). This repositor devised in the hope of fulfilling some of these requirements is made of fabric reinforced rubber and consists of a hollow elliptical ring and a long tail tube. On one side of the oval is a small pocket to facilitate introduction. The outside measurements of the oval are 8 by 6 centimeters, the central opening being 2 centimeters less in all diameters. The tube is 45 centimeters long. The fluid capacity at full distention is about 40 cubic centimeters. Distended the repositor withstands a pressure of 300 milligrams mercury, which is far above the compressor points of a uterine contraction (Schatz).

Method of introduction. With the patient in the usual position with the pelvis well elevated the *first step* in reposition of a pulsating cord is to introduce the flat, collapsed repositor into the vagina and with the fingers or forceps draw the prolapsed loop through the opening in the oval (Fig. 2).

Then directed by the internal fingers the tip of the uterine sound or uterine forceps enters the pocket on the oval or the upper part of the oval is grasped by the forceps and the *second step* is the carrying of the repositor and engaged loop into the uterine cavity above the presenting part.

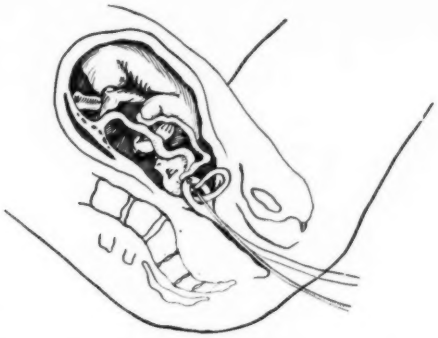

Fig. 2. The prolapsed cord is drawn through the repositor. The tip of the uterine probe is engaged in the repositor pocket.

The *third step* (Fig. 4) constitutes the distention of the repositor with sterile water and tying or clamping the tube. The probe or forceps is now removed and the distended repositor with the trapped cord remains in the space between the small parts and the uterine wall.

The tube when fully distended is still pliable and offers no resistance to the advancing head. The distended repositor with the loop of the cord within has the virtue of mass formation, providing a point of fixation similar to that of a small part upon which the cord can be looped. This is further augmented by the crossing of the planes of the distended repositor and the retained loop. The success recorded, in several instances in which repositors were improvised out of a piece of sponge or folds of gauze, was apparently due to this mass immobilization. These are important factors in self-retention. Failure in manual reposition is indeed caused by this very lack of fixation *en masse* for the mobile loop of the cord if not carried over a small part of the fetus follows the pathway of the withdrawing fingers and is expressed before the head can occlude the lower uterine segment. Again in the use of the catheter and stilette the withdrawal of the instrument offers a prompt return of the prolapse. Therefore, all authors advise that the catheter be allowed to remain in position in the hope of cord retention.

No metal or other stiffening substance is incorporated in the rubber repositor, first, because it is desirable to avoid the danger of injuring the uterine wall, placenta or child and second, because the collapsed repositor is more easily introduced through the undilated cervix and when distended is sufficiently rigid for safe retention within the uterus.

Fig. 3. The repositor being introduced.

In the experimental work done in part in the physiological laboratory of Northwestern University with the counsel and aid of Dr. Dragstedt the question of kinking and compression of the cord by the repositor both collapsed and distended was investigated. Simulating intra-uterine conditions as closely as possible and under varying degrees of angulation and compression the patency of the cord vessels was established by the passage of injected fluids.

In the cases where the repositor was tried out in an experimental way in the Chicago Lying-In Hospital the instrument was retained despite adverse conditions. The first was not a case of prolapse of the cord but of a fetus dead four or five days. The instrument was placed into the uterus well above the presenting part and the

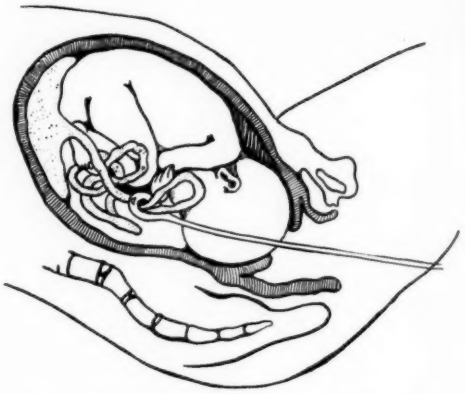

Fig. 4. The repositor with the loop of cord lies amid the small parts. The repositor is distended with water and the uterine sound withdrawn.

intern did a craniotomy. Despite all the manipulations necessitated by the operation the distended repositor remained above the head and when the fetus was extracted it came out alongside the feet. The second case was a multipara who entered the hospital with a history of five and one-half months' pregnancy and a prolapse of the cord for ten hours. There were feeble pulsations in the cord which was prolapsed externally. The cervix was dilated to 2.5 centimeters and thick. The hydrostatic repositor was used and the long prolapsed loop thoroughly disinfected was easily returned into the uterine cavity. A 6-centimeter Voorhees bag was then passed into the cervix. Eight hours later the bag and fetus were expressed. The cord and repositor were retained until the fetus was born.

In the hope of reducing the high fetal mortality due to the accident of cord prolapse and also in the hope of providing the obstetrician with a serviceable, self-retaining repositor this instrument is presented for trial.

EDITORIALS

SURGERY, GYNECOLOGY AND OBSTETRICS

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JULY, 1924

SPINAL CORD TUMORS

SIR VICTOR HORSLEY, in 1887, successfully removed the first spinal cord tumor, and it was not until then that the surgical profession believed it possible to remove such lesions. Since then the number of spinal cord tumors localized and removed has steadily increased. It has always been the general impression that spastic paraplegia is due to some form of sclerosis, syphilis, or myelitis, and the treatment has been either expectant or antisyphilitic.

The history of a patient suffering from spinal cord tumor is more or less characteristic, in that the patient complains either of a progressive loss of tactile, pain, and temperature sensibilities, or loss of motor function; the progress of the symptoms depends on the location of the neoplasm. If the tumor is situated dorsally, sensory disturbance will be the first symptom; if anteriorly, the first complaint will be one of motor disturbance, and if laterally, anterolaterally, or dorsolaterally, a combination of symptoms, sensory and motor, will develop, commonly known as the Brown-Sequard syndrome. Root pain is usually present because of traction on the sensory root, and patients are seen with this complaint who have had various operations for abdominal lesions without relief; there are, however, cases in which the tumor develops without root pain. Disturbances of the rectum and bladder occur late in the course of the disease, unless the lesion is an intramedullary tumor.

The history of spinal cord tumors differs from that of sclerosis, in that a definite level of either sensory or motor disturbance below a given segment appears, whereas in sclerosis there are numerous areas throughout the cord or in the brain where the symptoms are manifested. The history of cord tumors also differs from that of myelitis; in the latter disease there is usually a rapid and quite complete history of infectious myelitis within a few days or a week following the onset of the trouble. In chronic meningomyelitis, however, the symptoms simulate those of cord tumor.

The patient with spinal cord tumor has a loss of reflexes at the level of the tumor and increased reflexes below the segment involved. Aside from the importance of obtaining a complete history of the case, several tests are of value. Spinal puncture findings usually show an increase in the globulin, and occasionally the fluid is yellow in appearance, due to xanthochromia, which is significant but not pathognomonic. A block in the flow of the cerebrospinal fluid in the spinal canal is significant, as it is more often caused by cord tumor than by adhesive arachnoiditis. The differential pressure in the cerebrospinal fluid between the posterior cistern and the fourth lumbar interspace, brought out by Ayer, is valuable

in determining a total or partial block in the flow of the cerebrospinal fluid. Pneumography of the subarachnoid space of the spinal canal, originated by Dandy, is of diagnostic aid. Lipiodol injection into the subarachnoid space of the spinal canal for radiography, as developed by Sicard, is also valuable in diagnosis and localization. While all of these special tests are of value in determining localization, they do not compare with a thorough neurologic examination, and should be used only when it is otherwise impossible to determine the exact level of the lesion.

Spinal cord tumors differ from brain tumors, so far as the possibility of removal is concerned, in that 60 per cent or more of spinal cord growths are encapsulated, removable neoplasms, such as endotheliomata, fibromata, psammomata and neurofibromata; the remaining percentage of such lesions consist of intramedullary gliomata or extradural fibrochondromata, sarcomata, and metastatic tumors. The tumor which can best be removed is the subdural but extramedullary tumor, the growth which produces direct pressure.

The operation generally employed is bilateral laminectomy over the segment involved, unless the operative field is in the cervical region, in which case a unilateral laminectomy may be sufficient to expose the tumor. While a general anæsthetic has been commonly used, the paravertebral local anæsthetic has proved of great value, because of the greatly diminished bleeding and the lessened surgical shock. The postoperative care is ordinarily like that given in general surgical cases, except in cases in which there is involvement of the bladder, which demand special attention to avoid pyelitis and pyelonephritis.

When the results following removal of spinal cord tumors are compared with those following operation for malignancies of the cardia, stomach or colon, one cannot help being impressed with the possibilities of surgical treatment in these cases, as 60 per cent of all spinal cord tumors exposed at the time of laminectomy are removable, which means complete and permanent recovery if the case is diagnosed sufficiently early. A. W. Adson.

THE VALUE OF RADIUM AND X-RAY IN THE TREATMENT OF MALIGNANT DISEASES

OPINIONS on many subjects in surgery vary markedly among surgeons of the widest experience because each one is obliged to draw his conclusions from his own individual experience which, necessarily, differs more or less from that of every other surgeon. Especially is this true in considering methods of treatment and in selecting a particular method to be applied in an individual case. The experiences, the prejudices, or the resources of one clinic determine the selection of a specific method, whereas varying conditions in another clinic will result in the adoption of an entirely different procedure. Because of this, a comparison of the results in these two clinics is obviously impossible.

The difficulty is probably more manifest in reaching a just conclusion in regard to the value of X-ray and radium in the treatment of malignant diseases than in any other subject in surgery. Undoubtedly some advocates of radiotherapy have been injudicious, as many cases in which marked benefit was obtained by radiation have been published as "cures" at periods considerably less than the 3 years generally accepted in surgical literature, and often unsupported by pathological evidence of malignancy. Prejudiced by these reports, many surgeons continue to employ the operative measures with which they are familiar, and do not trouble to determine at

first hand the value of radiation, either alone or in combination with surgery.

The American Surgical Association first recognized the growing need for a just and critical review of the various methods for the treatment of malignant diseases; and in February, 1922, by mutual understanding, the American College of Surgeons appointed the committee to make the investigation, as the problem is one peculiarly suited to its organization, and of such character as amply to justify the employment of its resources.

Carcinoma of the cervix uteri was selected by the committee as the most important subject for immediate study. Complete and uniform case records were secured of all such cases admitted to the wards of the twenty-two clinics concerned in the investigation, and from the mass of material thus collected a preliminary report (see pages 18 to 26) has been prepared, and such conclusions drawn as seem to be justified by the facts presented. It is to be noted that the statistical results have been subjected to the mathematical corrections commonly used by statisticians in making allowance for the numerical variations due purely to chance, a method not usual in medical and surgical reports.

It is the purpose of the committee to continue the collection of data; to extend the three-year time limit to five years and even longer; and to publish further supplementary reports which will include the details of operative treatment as well as the technique of radiotherapy employed. Similar investigations are also under way in cancer of the breast and of the mouth and tongue, and the value of radiotherapy in these and other forms of cancer will be made the subject of subsequent reports.

It is believed that the findings of the committee will be of interest and value not only to the individual Fellows of the College, but as well to the whole science of surgery.

THE JUNIOR CANDIDATE

THE American College of Surgeons is performing a very definite duty in looking well to the future. One of the greatest statesmen who ever lived was responsible for the saying: "Where there is no vision, the people perish."

The establishment of the Junior Candidate Group in the College of Surgeons is not a means of "shaking the bushes" to secure a larger membership in the organization, but rather an effort on the part of the College to render a very real service to the younger men who will be the surgeons in the years to come.

As has been already stated many times, the junior candidate is not a member of the American College of Surgeons in any sense of the word. He is but a candidate for Fellowship and is not eligible to be considered for membership in the College until at least seven years after graduation. It is the earnest desire of the College to assist these young men both ethically and professionally in the earlier years of their development. Each junior candidate must be well recommended and approved by his respective Credentials Committee. He must also take the oath and declaration against fee splitting and other unethical practices. Year by year the junior candidates list will be carefully reviewed by the Credentials Committees. The name of any candidate may be removed at any time for sufficient reason.

This junior candidate movement is a policy of service both to the profession and the public. It is full of possibilities for the future development of practical, scientific surgery. Its full value will be realized year by year in the unfolding of the future.

Details of the plan for the organization of a Junior Candidate Group may be found on pages 126 to 127 of this issue.

MASTER SURGEONS OF AMERICA

HENRY JACOB BIGELOW

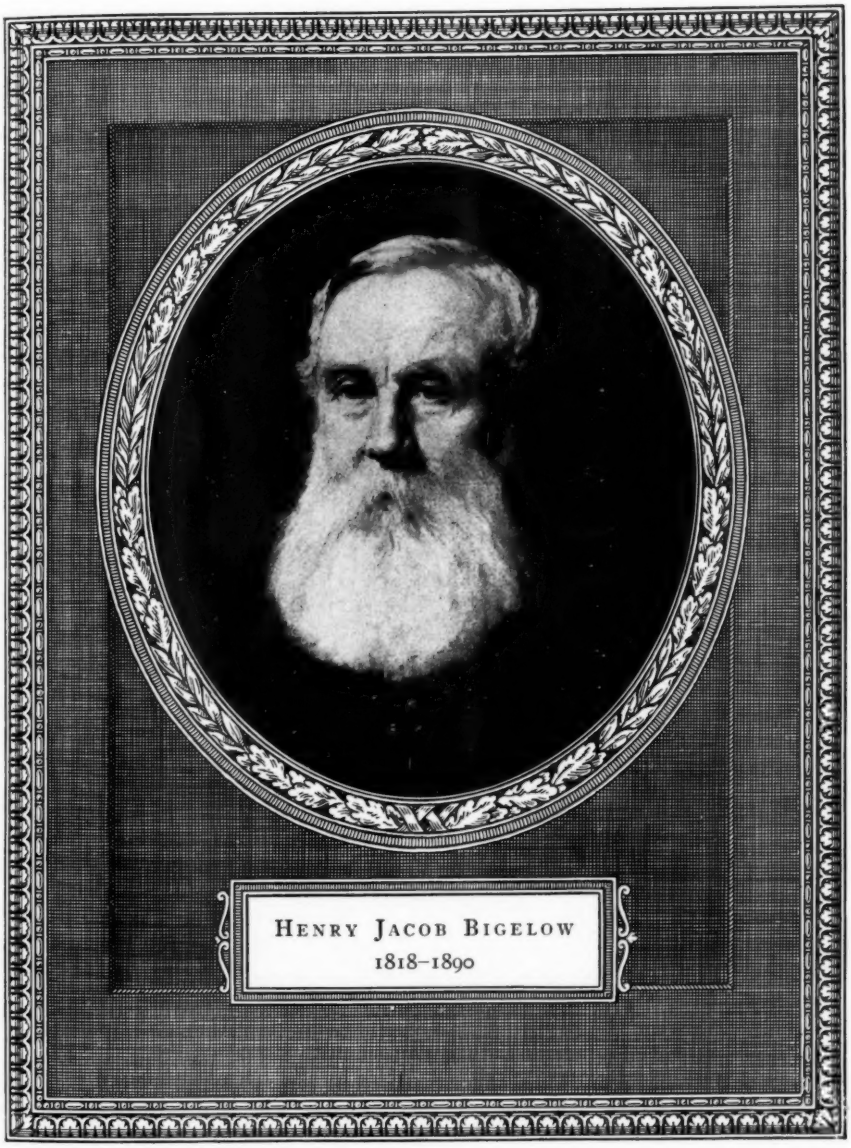
HENRY Jacob Bigelow was born in Boston, Massachusetts, March 11, 1818. He was the son of Dr. Jacob Bigelow and his wife, Mary Scollay Bigelow.

The senior Bigelow (1787–1879) was the third of that name in lineal succession, and he came from old New England stock. Graduating from Harvard in 1806, he received his degree of Doctor of Medicine from the University of Pennsylvania in 1810. For nearly 50 years thereafter he was Professor of Materia Medica in the Medical School of Harvard University, and also, for a long period, Rumford Professor of the Application of Science to the Useful Arts, in the Academic Department of the same University. He was president of the American Academy of Arts and Sciences from 1846 to 1863, and a member of other prominent associations in this country and abroad. He was the author of many botanical and medical works of value, and of addresses and essays on educational and kindred subjects. He conducted a large medical practice in Boston, and he was highly esteemed for his virtues and for his wisdom. The wife of Dr. Jacob Bigelow has been described as possessing, in addition to her womanly virtues and gentle nature, great strength of character. For those who believe in the hereditary transmission of unusual qualities, this sketch concerning the parents of the subject of this memoir may be of interest.

After preparation at the Boston Latin School, young Bigelow entered Harvard College, and graduated in the class of 1837. Associates of his youth have testified that, even at that period of his life, he gave evidence in many directions of marked ability, both physical and mental.

He began his medical education with his father, and later he was house surgeon in the Massachusetts General Hospital. After this he sailed for Europe, coming home to receive his medical degree (in 1841), but returning soon again to Europe to continue his studies. He spent three years there, principally in Paris, crossing the channel frequently to attend the lectures of Sir James Paget in London; for an intense interest in surgical pathology, gross and microscopic, manifested itself early.

On returning to America he was made instructor in surgery in the Tremont Medical School, succeeding Dr. Reynolds. This school was finally united to the



HENRY JACOB BIGELOW
1818–1890

Medical School of Harvard University, in which, in 1849, he was appointed professor of surgery.

Coming fresh from Europe, saturated with what were then the latest medical and surgical ideas, he became at once a prominent figure in his chosen profession. In 1846 he was appointed surgeon to the Massachusetts General Hospital; and, about this time, his long career of professional activities and usefulness, which included many contributions to the advancement of surgery, began. Within a few months after he received his appointment to the Hospital, the anæsthetic effect of ether inhalation was successfully demonstrated there by Dr. William T. G. Morton on one of Dr. J. C. Warren's patients; and Dr. Bigelow, recognizing at once that the anæsthesia was "safe, certain and complete," and realizing "with almost prophetic appreciation," its enormous usefulness to the human race, took steps forthwith to announce to the world the great discovery, and to champion its cause, the result being that the use of ether, as a means of producing unconsciousness during surgical operations, was adopted far and wide. It has been said: "Dr. Bigelow's own aversion to giving pain must often have caused him to look back with peculiar pleasure upon his share in alleviating surgical suffering."

On May 8, 1847, Dr. Bigelow was married to Susan, daughter of Hon. William Sturgis, of Boston. She died, however, in 1853, leaving an infant son, who, born in 1850, is now Dr. William Sturgis Bigelow, of Boston.

A persistent *investigator* of surgical problems, Dr. Bigelow directed upon them the full force of his extraordinary powers of scientific analysis, and his intuitive knowledge of applied mechanics.

His first important investigation, upon which he spent a number of years (1861–1869) was upon dislocation of the hip. It was while studying the mechanics of this injury that he discovered and described the iliofemoral (the "Y") ligament, and saw clearly the significance of the control which it exercises over the head of the femur during, and after, dislocation. He saw clearly how he could utilize this control in causing, by manipulation alone, the displaced head of the bone to return to its socket along the same route it had travelled during the act of dislocation. His advocacy of this intelligent method of reduction, in place of the complicated, painful and unsuccessful method of horizontal traction by ropes and pulleys, which, inherited from England, had been hitherto in vogue, marked a long step in advance in the treatment of hip dislocations; and the publication of these facts was sufficient alone to entitle Dr. Bigelow's name to a prominent position in the history of surgery.

Dr. Bigelow's analytical and practical mind was applied to many other problems connected with surgery and surgical practice; and it really seemed that every subject he touched was bound to be elucidated, the result of his work marking a definite advance in that line. It is probably fair to say that no surgeon

of his time, at least in New England, made so many contributions to surgery or introduced so many improvements as Dr. Bigelow.

The result of his investigations in the operative treatment of stone in the bladder was hardly secondary in importance to his work on hip dislocation, and it gave him a world-wide reputation. In those days lithotomy had a far higher mortality rate than it has today; and, while there was some difference of opinion as to the relative merits between lithotomy and lithotrity, the latter operation was usually preferred when, in any given case, it actually came to a choice. Dr. Bigelow, however, was so much impressed with the high mortality following the crushing operation that he studied the matter with great care, and finally reached the conclusion that this high rate was not due to instrumentation, but rather to the presence in the bladder, after each operative sitting, of sharp and angular fragments of stone, resulting in direct injury to the walls of the bladder, and to a dangerous cystitis, not to speak of the inevitable pain and suffering for the patient. This was a most important discovery, and constituted a real intellectual triumph! He therefore concluded that the stone, or stones, should be removed *at one operation;* for, by this procedure, the bladder walls would not be damaged by the stony fragments left after the operation, and infection would not be so apt to follow.

Having demonstrated the tolerance of the bladder for prolonged instrumental interference, he devised a method for removing the stone or stones at one operation, after they had been crushed into small fragments by the lithotrite. This was done by alternately flushing the bladder with water through a large urethral tube —generally a straight one—and then partially emptying it again. To this tube was attached a capacious rubber bulb, with a catch-basin to receive the fragments removed from the bladder with the outgoing stream. He gave the name of "litholapaxy" to this operation, a procedure which became in those days the best operative treatment available for these troublesome cases, and one which still has its advocates. He spent years in studying the details of this operation, during which he perfected the necessary instruments, which, I believe, are in use today.

The publication of this operation developed sharp criticism in this country and in Europe, assertions being made that his methods had already been used by others, and further that it was questionable whether, after all, they represented a real advance over those of the old operation. The controversy raged for years, until finally Dr. Bigelow was invited to open a discussion at the International Medical Congress which took place in London in 1881.[1] After twice declining this invitation he finally accepted it, and his ingenious method of demonstrating the operation, by means of an artificial bladder, was so convincing that his methods were generally accepted as representing a genuine and important contribution to surgery. In a private letter to Dr. Bigelow, John Eric Ericksen,

[1]Bigelow, H. J. "Modern Lithotrity." Tr. Internat. M. Cong., London, 1881, vol. ii, pp. 292-306.

president of the Surgical Section, wrote: "Your operation is the first real advance in the treatment of stone since Civiale perfected his system of lithotrity."

As a *reader*, Dr. Bigelow was not "omnivorous," and yet, when seeking information, especially along lines of his investigation, he would, as Dr. Oliver Wendell Holmes said of him, "get what he wanted out of a book as dexterously, as neatly, as quickly as a rodent will get the meat of a nut out of its shell," and also, in referring to his originality, that, "he took life at first hand, and not filtered through alphabets."

As a *writer* his publications were not numerous, but they seldom failed to add something new and useful to the surgical information and practice of the day. No article written by him failed to excite attention; and the marked interest in his writings on surgical practice, especially in New England, was far reaching.

As a *teacher* he was pre-eminent. His dignified, impressive personality, his concise and forceful language, his humor, his wit, his interesting, and picturesque illustrations, never failed to make their deep and lasting impressions on the students who crowded his clinics. He had, in a marked degree, the ability of impressing his students with just the information he wished them to remember. Dr. Reginald Fitz said of him that "his lectures were models of condensed thought and applied knowledge."

He was professor of surgery, and professor of surgery emeritus, for more than 40 years. So great was his influence it might almost be said that, during his professional career, he founded in New England *a school of surgery;* and the effect of his teachings is felt here today, even by surgeons, who had not the privilege of attending his lectures. Tall, handsome, magnetic and commanding, compelling respect and attention, he was a natural teacher and a leader of men; and he impressed his personality upon everyone with whom he came in contact.

As an *operator* he was calm and self-possessed, with quickness of observation and decision, and with great manual dexterity and grace, although it goes without saying, that the rapid operating, which conditions in those days seemed to require, and the imperfect asepsis then in use would hardly meet with approval today. Dr. David W. Cheever said of him that "to see him operate was to recognize a master."

It is but natural, however, that, in spite of his remarkable insight into surgical problems, and his numerous achievements resulting from it, he should toward the end of his life have failed to foresee the extraordinary results which were to follow the development of the antiseptic system. He was at this time rather inclined to look askance at many of the new operations, and even to consider them unjustifiable. If this revolution in operative methods had come earlier in his career, when his powers were at their height, he would probably have seen more clearly.

The sphere of Dr. Bigelow's activities, outside of surgery, was a very broad one. Lack of space prevents even the enumeration of the many subjects upon which his careful attention was directed during his life. He was always original, and his mind seemed ever on the search for possibilities of improvement. He left his mark of genius upon everything he touched.

In addition to his other gifts Dr. Bigelow was a highly cultured person, and, being most favorably placed as to social environment, he improved his opportunities to become familiar with all that is best in the fine arts. He was a regular attendant at the Boston Symphony Concerts, and he was for many years an influential member of the Board of Trustees of the Boston Museum of Fine Arts.

He resigned his professorship in the Harvard Medical School in 1882, and his position as surgeon at the Massachusetts General Hospital in 1886, to both of which institutions he had rendered eminent service. After retiring from his professional activities he led a quiet life at his country home in Newton, Massachusetts, until his death, October 30, 1890, at the age of 72 years.

GEORGE H. MONKS

TRANSACTIONS OF SOCIETIES

CHICAGO GYNECOLOGICAL SOCIETY

REGULAR MEETING HELD JANUARY 18, 1924, DR. CHARLES S. BACON, PRESIDING

PRESENTATION OF ROENTGENOGRAMS: (1) ENLARGED THYMUS IN NEWBORN; (2) PRIMARY BROW AND FACE ATTITUDE, BREECH PRESENTATION; (3) FLAT PELVIS—NO OVERRIDING OF HEAD ON PUBIS; (4) CONGENITAL SYPHILIS AND NORMAL CHILD; (5, 6, 7, 8) FORCEPS APPLIED WHILE LABOR PROGRESSES; (9) TWIN LABOR

DR. J. B. DELEE: I have a few X-ray plates which I would like to show. The first is that of an enlarged thymus in the newborn. The baby was delivered without any particular trouble but could not be gotten to breathe. A tracheal catheter was inserted and passed down almost to the base of the lung showing that the passage of the trachea was free. In spite of that we could not get the baby to breathe. The child lived two and a half hours. At postmortem the thymus weighed 29 grams. I believe there is something that prevents life from being established in these babies other than mechanical obstruction from an enlarged thymus.

The second plate is also from the Lying-in Hospital. It shows a primary brow or face attitude but it was a breech presentation and this picture was taken a month before the baby was born. The baby occupied this position throughout pregnancy. The woman had a contracted pelvis and I tried very hard to rotate the body so as to bring the head down over the inlet. I tried five different times but was unsuccessful. I delivered her by low cæsarean section. The baby still holds its head up in that way and the face is flattened. The point in that picture is the peculiar attitude. It also shows that a breech presentation cannot always be changed to a head. The reason in this case was a unicornous uterus.

The third picture shows a woman with slightly flat pelvis in which you would think there was an overriding of the head on the pubis but there was not. There was a little lateroflexion, probably the marks of obliquity of Naegele. This case was terminated by forceps after natural and easy engagement of the head.

The fourth is a case of congenital syphilis. The baby when only a few days old showed the marked evidence of syphilis. There is a wide thickening of the bones, especially in the heads of the tibia and fibula. The mother has a positive Wassermann, 4+. For comparison I show you here an X-ray picture of a normal baby.

The fifth is a picture taken of a woman in labor, with the forceps applied. We delivered her on the X-ray table. I show it to you to demonstrate how the head lengthens in the grasp of the forceps. There was slight movement of the head at the time the picture was taken. The next picture shows the forceps moved and the baby's head distending the vulva. You see the immense displacement of the soft parts around the head. It also shows the molding of the head with overlapping of the bones. There is one point of scientific importance in the mechanism of labor. Sellheim declares the clavicles are vertical and we often find them so during delivery. Here they are transverse. The next picture shows the head delivered and the soft parts retracted around the neck. This picture is intended to show how the ribs are pinned down with a very great compression of the chest. When the compression of the chest is released breathing is established as the expansion draws in air.

The last picture shows a twin labor. The second child was delivered first.

TWO CASES RELATING TO THE THEORY OF THE CORPUS LUTEUM

DR. RAYMOND H. MCPHERRON: "Possibly with the exception of the phenomenon of consciousness there is no fact of life that excites more interest and seems to offer greater difficulty in arriving at any definite conclusions than the function of reproduction." Thus Howell prefixes the chapter on reproduction in his work on physiology; and I believe that most of the younger men, at least, will agree with him readily.

One of the angles of the question that has received its share of research and observation has been the corpus luteum. It may seem a bit presumptious to attempt to draw any conclusions from two cases, but I believe that even among those men doing extensive work in gynecology, the actual observation of corpus luteum verum is relatively rare.

The two cases that I have to report were operated upon by different operators at the Post Graduate Hospital.

CASE 1. Mrs. O. T., age 26, said the menses began at 14, and were regular every 4 weeks, moderate in

amount, lasting 4 days, accompanied by no pain, with few small clots, but no leucorrhœa. She had been married six months. The last menstruation was October 11 to 15, forty-two days before admission to the hospital. There had been no nausea or vomiting. The patient noticed that she was a little pale. She consulted a physician who discovered a pelvic cyst. She had had no abdominal or pelvic discomfort. She entered the hospital November 22. Examination revealed no goiter, enlarged glands, œdema, or varicosities. Heart and lungs were O. K. The uterus was anteverted, soft, the size of a six weeks' pregnancy. To the right and behind the uterus was a cystic tumor the size of a man's fist. The left appendages were O. K., as was the urine. A diagnosis of a right ovarian cyst was made.

The patient was operated upon November 23, when the cyst was removed from the right ovary. In the left ovary lay a corpus luteum with a thin wall at its highest point. During the gentle manipulations the stigma ruptured and a very little serum escaped. The ovary and uterus were not handled further.

An adherent retrocæcal kinked appendix was removed. The convalescence was uneventful. There was at no time any bleeding or labor pains. The patient ten days later reported the pregnancy uninterrupted.

CASE 2. Mrs. E. C., age 23, had been married five years, but had never been pregnant. The menses began at 15, were regular, moderate, and not painful. The general physical condition was good except for possible pulmonary tuberculosis two years ago.

The patient entered the hospital November 23, having complained of a pain in the right side for five days. The pain was constant and usually dull, but at times quite sharp. It was increased by motion, and not relieved by ice packs or bowel movements. The last menstruation was October 1.

Twenty-four hours before admission to the hospital she began vomiting. There was no rise in her temperature. Two days before there had been slight bleeding following bimanual examination.

A diagnosis was made of left ectopic pregnancy or corpus luteum cyst.

Physical examination was negative except for marked tenderness in the left lower quadrant. No tumor was palpable externally. Vaginal examination revealed a tumor on the left ovary about the size of a walnut. The uterus was soft, and the size of a six weeks' pregnancy. The urine was negative. The blood count was non-committal, the polymorphonuclears being 70 per cent and total whites 8,000.

At operation, on November 24, a cyst was removed from the left ovary. It was about the size of a walnut, and highly inflamed.

The appendix was found to be acutely inflamed. It ran for three inches subperitoneally before entering the cæcum. It was removed.

Convalescence was uneventful except that she aborted 48 hours after operation.

On examination the cyst proved to be a corpus luteum verum, the cavity of which contained 2 or 3 drams of blood clots and serum. The walls of the cyst and the lutein cells were hypertrophied.

The development and growth of the corpus are fairly well agreed upon by observers, but concerning the physiology there is some difference of opinion.

When the graafian follicle has matured it ruptures at the stigma, and the egg is discharged into the peritoneal cavity to be received by the fallopian tube. The rupture of the follicle, according to Clark, is due to the increased vascular tension within the ovary. The pressure is thus increased within the ovary, and forces the follicle to the surface, and the circulation at the most projecting portion is so diminished as to cause necrotic changes at the stigma, where it finally ruptures. The ovum then escapes and the walls of the follicle collapse—the space being filled with blood from the ruptured vessels. Some blood may escape into the peritoneal cavity. Gradually the follicular cavity becomes filled with lutein cells. The central area frequently contains blood clots.

The collapsed follicle thus grows a second time so that by the end of 2 weeks it may be the size of a bean. The further history of the corpus luteum depends on whether or not conception takes place. If fertilization takes place and pregnancy continues, the life history of the corpus luteum is prolonged. Instead of undergoing absorption at three weeks like the corpus luteum spurium, it continues to increase in size due to proliferation of the lutein cells. It reaches its maximum at about the sixth month, sometimes reaching the size of a hickory nut. It is frequently palpable on bimanual examination, as in one of the cases being reported. Authors are agreed, I believe, that there is no histological difference between the corpus luteum verum and spurium. However, concerning the development of the two, there is some difference of opinion due to difficulty in obtaining material.

Opinions differ in regard to the physiological importance of the corpus luteum. The most common opinion, however, is that the lutein cells have a secretory function which in some way controls the development of the egg and the activities of the uterus. In fact, it seems that the stability of pregnancy is dependent upon the integrity of the corpus luteum, for removal during early months of pregnancy usually causes abortion. The exact time when the corpus loses this function, probably in favor of the placenta, is not known.

"Veterinary surgeons have made an important discovery. Sometimes in expressing what they considered a false corpus luteum, to produce heat, they actually expressed or ruptured a true corpus, in which instance one of two things invariably happened, either the cow bled to death in a short time, or she aborted in 24 to 36 hours. This observation on cows throws a very interesting light on the problem of abortion. Ochsner says this experience by veterinary surgeons, as well as his own experience

in operating upon pregnant women leads him to believe that abortions following abdominal traumata are caused by injuries to the true corpus, and not to traumatism to the uterus itself; and that in operating upon a pregnant woman the important precaution is to avoid injury to the ovary containing the true corpus luteum, if one wishes to avoid interrupting pregnancy."

These observations throw a very interesting light on the part played by the corpus luteum in abortion, sterility, premature menopause and internal hæmorrhage simulating extra-uterine pregnancy.

During pregnancy, if a woman receives an injury to the abdomen, as, for instance, a fall, or during bimanual examination, it is not the traumatism to the uterus which brings on the abortion, but the injury to the ovary which causes the corpus luteum to rupture. If rupture takes place through a blood vessel in the wall of the corpus, intra-abdominal hæmorrhage occurs, which, if prolonged, may show all physical signs of extra-uterine pregnancy.

Is it not possible that in dilating and curetting for sterility a false corpus is unknowingly expressed during the process which prepares the way for conception?

DISCUSSION

DR. SYDNEY SCHOCHET: There are one or two points which I think might be questioned. The first is the assumption of the so-called pre-formed avascular area described by Clark in 1899. We know that gradual pressure in other parts of the body does not lead to atrophy but rather to a hyperplasia of the tissue cells. To assume that in the process of the growing graafian follicle atrophy of its walls occurs through pressure would be contrary to known accepted biological laws.

The rupture of the follicle, I believe, has been conclusively proved to be due to a specific enzyme present in the liquor folliculi.

The next point, that the corpus luteum contains a specific substance that produces the changes in the uterus in pregnancy, is questionable. It has been shown that any embryonic tissue can produce similar changes in the uterus and mammary gland. Whether these changes are due to endo-enzymes of cells or only from corpus luteum cells must receive more actual proof than the two illustrated cases.

I do not think we should make broad general statements unless we can substantiate them because the literature on the ovaries is quite questionable as it exists.

PRESENTATION OF A CASE OF CHORIO-EPITHELIOMA OF THE TESTIS

DR. SCHOCHET: I am making this case report before the Society because the etiology of chorio-epithelioma in the medical literature is erroneously stated, especially in the text books of obstetrics and gynecology. The usual statement found is that chorio-epithelioma follows pregnancy, abortion, and hydatidiform mole. DeLee's *Obstetrics* was the only exception. In this the origin in the mole was recorded.

The specimens here were observed in a necropsy in the Pathological Department of the Philadelphia General Hospital on the Service of Dr. Solis-Cohen. A detailed report will be made at a later date but I do wish to emphasize that chorioma arises either from misplaced sex cells (by parthogenesis) or misplaced blastomeres rather than from normal placenta. It is just as erroneous to assume that it takes its origin from placental tissue as to presume that carcinoma arises from normal adult tissue cells.

PRESENTATION OF SPECIMENS SHOWING EXTREME RETRACTION OF MEMBRANES BEFORE BIRTH

DR. RUDOLPH W. HOLMES: I present a placenta from a case of ablatio placentæ which manifests a very unusual anomaly, namely, retraction of the membranes about the cord presenting as a convoluted mass on the fetal surface of the placenta. Though now hardened in Zenker's fluid the membranes were as you now see them at the time of expulsion of the organ. In other words, the fetus survived for a few days existing outside the amnion and chorion. When fresh it was possible to pull the membranes out showing that there was not an annular rupture leaving a large part of the membranes behind. Further from the situation of the opening the placenta must have had a near fundal attachment. The patient from whom this specimen was taken had bled for six weeks intermittently; nine days before her admission to the hospital the membranes had ruptured; she was delivered about two hours after such entry. The baby was in about the twenty-sixth week of pregnancy. It gasped and died.

Many authorities have maintained that there was no such complication as a placental prolapse though before Puzos and Rigby it was believed all instances of what we now know as placenta prævia were in fact instances of prolapse. They clearly differentiated between prævia and so-called accidental hæmorrhage. I believe this retraction of the membranes illustrates the possibility of placental separation, prolapse and delivery before the birth of the child. Dr. William B. Fehring presented an instance of prolapse before this society shortly before his death.

A HYDROSTATIC REPOSITOR FOR PROLAPSE OF THE UMBILICAL CORD

DR. DAVID MONASH presented a paper entitled "A New Hydrostatic Repositor for Prolapse of the Umbilical Cord." (See p. 106)

DISCUSSION

DR. C. E. PADDOCK: For a long time we have depended on the old method of replacing the cord and so far as I know there has been nothing new ad-

vanced in the last twenty years. This is certainly an addition to the obstetrical armamentarium and I believe it is a good thing; in fact I am willing to try it at the first opportunity. It looks to me as though it would work. I am glad that we are improving along that line.

RUPTURED UTERUS; REPORT OF FOUR CASES

DR. DAVID S. HILLIS presented a paper entitled "Ruptured Uterus; Report of Four Cases." (See p. 32.)

DISCUSSION

DR. J. B. DELEE: The admission of four cases of ruptured uteri to one hospital in a few months should be enough to convince of the necessity of an investigation into any method of cæsarean section which offers at least a promise of reduction in the number of these cases. As you know, I have been very much interested in and have been trying to get the members of the Gynecological Society to practice the low cæsarean section. I believe that the presentation of Dr. Hillis deserves the earnest attention of the Society. If we want to give these women who have had cæsarean section the full benefit of our art they must live in the hospital after the seventh month. The low cervical cæsarean section does give some hope in this regard. I have seen a few cases which prove that we are justified in the hope we place on it. In subsequent cæsareans the scars have withstood a test of labor. In continental clinics experience justifies the statement that rupture of the scar from cæsarean section performed in the lower part of the uterus is much rarer than from that performed in the upper part. Thousands of these low cæsarean sections have been performed and only three ruptures have been reported. When an operation is trying to gain a foothold and trying to replace another operation all the bad results are going to be reported. Since only three have been reported I think we are justified in saying that low cæsarean section does prevent the occurrence of these accidents.

DR. EUGENE CARY: I would like to add another case to those in Dr. Hillis' paper. Early this month I operated on a patient who had had a cæsarean section previously at the County Hospital. She came into the hospital with a markedly contracted pelvis and in rather active labor. The membranes had ruptured and she was prepared immediately for operation. We got along without any trouble up to the time the abdomen was opened. As was our custom, after everything was ready to open the uterus, we gave pituitrin. We gave one ampoule and as we made ready to open the uterus we noticed a scar about five inches long in the uterine wall. As I put down the knife to open the scar it burst apart and the fetus was extruded into the operative field. I think if that patient had been allowed to continue in labor or if the membranes had not ruptured allowing the uterus to contract she would have had a rupture before operation.

DR. ARTHUR H. CURTIS: At the recent meeting of the American Gynecological Society, Williams reported a very large series of cæsarean section operations in which there had been a rupture at the following pregnancy. In no instance was there a tear of the uterus through the scar. May I ask whether it was possible to obtain a history of postoperative infection at the first operation in these cases?

DR. DAVID S. HILLIS (closing): In answer to Dr. Curtis, two of the cases showed evidence of infection and two had not been infected.

The question of the cæsarean section scar is a most important one from the standpoint of subsequent labor. We would all like to know when it is safe to allow a patient to try a labor after she has had a cæsarean section. If we decide on the basis of previous history with reference to infection we may be wrong. We cannot examine the scar before the patient is delivered and there is no way known to determine whether a given scar will hold or not. I showed a case before this society a year or two ago in which the uterus had ruptured and the scar remained intact. I have done a second cæsarian section on many cases and found the scar in such condition that I believed it could have been trusted in a second labor. Here are four cases in which the scar could not stand the strain incident to pregnancy, much less the trauma of labor. At the County Hospital we have delivered cases which had a previous cæsarian with the operating room in readiness for prompt action in case of rupture, but have had no occasion to open the abdomen under these circumstances. Such a safeguard cannot be extended through pregnancy. The danger of rupture during pregnancy has generally been regarded as of secondary importance. These cases indicate that it deserves real consideration. If the scar of the cæsarian section done through the lower uterine segment proves to be less likely to rupture, we may look in this direction for at least a partial solution of this problem.

VAGINAL PLASTIC OPERATION FOR CYSTOCELE, VESICOVAGINAL FISTULA AND HIGH RECTOCELE

DR. THOMAS J. WATKINS: *Cystocele.* In discussing operative repair of cystocele I wish to emphasize the importance of thorough dissection of the anterior vaginal wall; of the making of fascial flaps by "skinning off" the mucous membrane from the fascia on either side by means of a sharp scalpel and of extending the fascial flaps well down over the urethral body, especially in patients suffering from incontinence. In such cases the fascia tends to retract and become fixed at this point and should be freely mobilized so as to give a large amount of loosened tissue for firm repair.

Thorough separation of the bladder from the cervix is important to insure sufficient elevation of the bladder wall when the hernia is closed.

It is also important to separate one or two inches of the broad ligaments from the cervix on either side so as to obtain a greater degree of mobilization and more firm tissue for the closure of the hernial ring. This procedure also lengthens the vaginal canal and displaces the cervix upward and backward which materially aids in the operative repair. The excision of a V-shaped piece of the anterior lip of the cervix is also often useful.

There are two objects in the repair of cystocele, one the firm closure of the hernial opening and the other, the restoration of the anterior vaginal wall, especially the urethra, to its normal location. Methods for the accomplishment of these two objectives will vary in the individual case depending upon the age of the patient, the extent of the lesion, and the complications present.

Vesicovaginal fistula. A thorough dissection such as given above was extremely valuable in the repair of vesicovaginal fistula, especially in the complicated cases involving the cervix or the neck of the bladder. This procedure eliminates the necessity for denudation and permits the conservation of all the tissues, which is important especially in cases in which there has been much loss of tissue. It also permits of a free mobilization even to the extent of bringing the upper part of the fistula down to the urethra. It is especially advantageous to freely separate the mucous membrane from the fascia along the urethra in cases involving the sphincter. In some apparently hopeless cases of sphincter destruction this will permit of the establishment at times of urinary control. He believes that in most of these cases the sphincter is not entirely destroyed but is retracted and it is for this reason that he emphasizes the importance of free mobilization of the fascia lateral to the urethral body.

High rectocele. In high rectoceles I use thorough dissection of the posterior vaginal wall extending over the hernial opening, "skinning off" the mucous membrane from the fascia in much the same manner as employed for cystocele. With such dissection the nature of the fascial lesion becomes easily discernible and restoration of the rectovaginal septum to about its normal condition is easily accomplished. There is always abundant tissue for closure of the hernial opening and this can be easily obtained if dissection is sufficiently extensive. Experience in the repair of these lesions induces the belief that high rectoceles are rather common, often neglected, and frequently disturb the rectal functions.

DISCUSSION

Dr. W. C. Danforth: Some time ago I saw Dr. Watkins clamp off and dissect the broad ligaments on either side in dealing with cystocele and prolapse of moderate degree. I have found this an exceedingly useful and very simple procedure which gives us very good results and takes but little time to carry out, particularly in dealing with prolapse of moderate degree.

Dr. Arthur H. Curtis: As Dr. Watkins has suggested, I believe there is no point in the technique of repair of vesicovaginal fistula which is so important as that of thoroughly dissecting out the bladder in order that the walls may fall together without tension.

I, too, am very much impressed with cutting of the broad ligaments and bringing them together in front of the cervix. I would like, however, to ask Dr. Watkins whether any of his patients on returning to him reported discomfort at the time of intercourse because of the ridge made by the folded ligaments. This week I saw two patients who complained of dyspareunia and I found there was a little sensitive ridge where the broad ligaments were folded together.

Dr. J. B. DeLee: I would like Dr. Watkins to tell us how we can prevent these injuries.

Dr. Watkins (closing the discussion): After Sims devised a non-capillary suture, that was the suture in use for many years and only recently have surgeons closed some of these openings with catgut. I take it that the reason why Sims and his followers got such good results from what they called the non-capillary suture was not because it was non-capillary but because it was a suture that lasted a long time, it did not absorb or cut out. The way to prevent tearing a handkerchief would be to keep from pulling too much on it and I take it that the way to prevent these tears is to do away with the amount of tension put upon it. I presume a deep episiotomy would be a big prophylactic in the prevention of rectocele.

Dr. DeLee: Would it be of high rectocele?

Dr. Watkins: More so of the high than the low because you get tension on the fascia from the cervix down, and the upper part of the fascia is the weaker part. I would just like to make this point. If one makes a rectovaginal examination on a patient who has never been delivered he must be conscious of the fact that there is very little firm tissue in the upper part of the rectovaginal septum, but if one examines the abdominal walls in a great many patients, those with large tumors and thin patients in whom the backbone and skin are about in apposition, one is also impressed that there is very little tissue in the abdominal wall and yet there is enough to prevent herniation. There is enough tissue in a vesicovaginal septum to prevent hernia-bearing accidents.

The question of preventing cystocele, I take it, would be entirely the question of preventing the cervix from being pushed down in front of the child's head. Just how that should be done is up to the obstetrician.

As to cutting the broad ligaments, I take it that in a great many of these cases the prolapse, especially an old prolapse, is very much the same as in a ventral hernia. In ventral hernia the tissues retract and become fixed and in an old cystocele the tissues retract and become fixed, and that is why there is not always an abundance of loose tissue unless we do a mobilization. By cutting the broad ligaments one gets mobilization. By bringing the

broad ligaments in front of the cervix, especially after taking a V-shaped piece out of the cervix, one builds up a buttress underneath the hernia and as most of these cases have some herniation the bringing together of the broad ligaments must raise the uterus by tilting the cervix backwards and upwards.

In operating for cystocele without opening the peritoneal cavity we have been impressed lately that by doing the repair work at the cervix first you get a very much better displacement of the cervix upward and backward than when you commence at the urethra and suture back.

AIR EMBOLISM IN OBSTETRICS

DR. JAMES A. GOUGH contributed a paper by invitation entitled "Air Embolism in Obstetrics." (See p. 27.)

DISCUSSION

DR. J. B. DELEE: The case the Doctor mentioned occurred before a class at Northwestern University, held in the clinic amphitheater of Dr. Murphy. The woman had placenta prævia and I had done a version followed by extraction. She continued to bleed and I was packing the uterus. She was in good condition and not anæmic. When the packing was about three-fourths finished she collapsed and turned blue and the anæsthetist said he heard a gurgling sound in the heart. I finished packing very rapidly, inverted the woman and practiced artificial respiration by powerful compression of the chest. In twenty minutes the woman recovered. We concluded it was an air embolism. I was so interested that I sent a letter to several obstetricians asking if similar cases during packing had come to their notice. I received one report of a patient who during the packing process had gone into collapse and died from air embolism.

DR. CHARLES E. PADDOCK: There is no death so tragic or which leaves the attending physician in such a feeling of helplessness and mental anguish as that occurring in child birth.

This paper tonight shows how helpless we are when certain accidents occur in child birth. When we consider the conditions present, the large venous sinuses and the air compression which must of necessity result when a placenta is removed manually or the hand is inserted into the uterus for other purposes, it is a wonder that more cases of air embolism and death do not occur.

It seems to happen just as frequently in normal deliveries as in difficult ones.

About twenty-five years ago, I had occasion to insert a Barnes' bag into the cervical canal for the purpose of inducing labor; suddenly the bag burst and in a minute the patient was dead.

At that time deaths from air embolism at child birth were thought impossible. Playfair, the noted English obstetrician, advised either the use of air or water when inflating the bag, thus evidently refuting the possibility of a rupture of the bag and death from air embolism. The sad part of the report of this case is that we will continue to see similar ones. How they can be prevented I do not know.

The exhaustive thorough postmortem examination done by Dr. Gideon Wells, and the report made a part of this paper, speaks well for the scientific interest shown by Drs. Gough and Hutchinson in arriving at the exact cause of death. There is a tendency on the part of the physician for sentimental reasons to avoid asking for a postmortem examination, a condition to be regretted.

DR. JOSEPH L. BAER: We use a routine in the maternity service at Michael Reese Hospital which I think has some bearing on this type of disaster. That routine consists in the immediate approximation of the knees of the patient at the termination of the second stage and again at the termination of the third stage. The direct purpose of that routine is to prevent an inrush of air into the uterine cavity. The extreme rarity of the occurrence of air embolism might tend to make such routine appear burdensome but it is just as easy to tell the patient to bring her knees together or to bring them together for her as it is to leave the knees widely abducted and I believe that this routine should be emphasized as a prophylaxis against this sort of fatality.

DR. RUDOLPH W. HOLMES: Air embolism is extremely rare and comes without forewarning and I hardly see how we may do anything to prevent it. The mechanics of its production are unknown though theories are rampant. I have used the intra-uterine tamponade on the slightest provocation, even using it as a prophylactic precaution in many instances in which I feared secondary atony or hæmorrhage. Repeatedly after the introduction of the gauze, air will be expelled from the uterus and vagina with gurgling sounds as contraction takes place. Likewise, I have heard air escape from the vagina where ergot or particularly where pituitrin had been used. If air within the uterine cavity contributes to air embolism it is truly remarkable that no instance has occurred in my experience following tamponade. If any prophylactic measure may be imagined I believe the routine light compression of the fundus for a period after delivery is a safe precaution.

DR. JAMES A. GOUGH (closing the discussion): As Dr. Wells described it, air embolism occurs almost exclusively in operative deliveries, and the reason is that when the hand or instrument is introduced into the uterus the latter is relaxed and air is carried in at this time. As soon as the hand draws down a limb in doing a version, or when the forceps is applied and traction is made on the head, the uterus begins to contract. In cases where air embolism has occurred it is assumed that partial separation of the placenta has occurred at one edge. The air that entered during the period of relaxation of the uterus gets between the uterine wall and the placenta. When the uterus contracts the air is forced directly into the open vessels.

ANDREAE
VESSALII BRVXELLENSIS,
PHILIPPI HISPANIARVM
REGIS, MEDICI,
CHIRVRGIA MAGNA
in septem libros digesta:

In qua nihil desiderari potest, quod ad perfectam, atque integram de curandis humani corporis malis, methodum pertineat.

Ab Ipsomet. Philosopho, ac Medico Regio, PROSPERO BORGARVTIO, recognita, emendata, ac in lucem edita.

Partes etiam hactenus desyderatas, quidam Chirurgi vocant, hic in libris operum deprompta sunt.

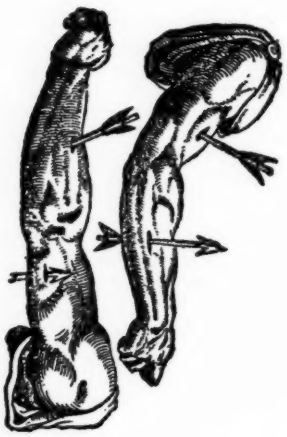
Cum amplissimis Indicibus tum capitum: tum rerum omnium memorabilium.

CVM PRIVILEGIO.

VENETIIS, Ex officina Valgrisiana.
M D LXIX.

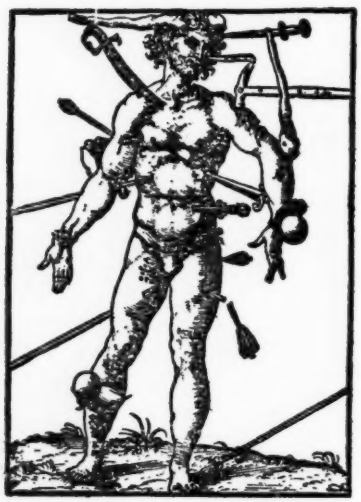
Ex Bibliotheca Windhagiana.

Brachia multifariam sagittis perfocata.



Andreae

Corpus multis modis vulneratum.



Quomodo

Quomodo plumbeus globus immissus extrahatur.

Brachia

THE SURGEON'S LIBRARY

OLD MASTERPIECES IN SURGERY

By ALFRED J. BROWN, M.D., F.A.C.S., Omaha, Nebraska

THE SEVEN BOOKS OF SURGERY OF VESALIUS

FROM its inception until recent years, surgery has been inseparably connected with anatomy. The men that we think of as great anatomists were also great surgeons and vice versa. Anatomy was the basis of surgical knowledge. The individual man might excel in one or the other and his name thus become connected with surgery or anatomy almost to the exclusion of the other. This was particularly true of Vesalius. He was so pre-eminent in anatomy that the fact of his being also a practicing surgeon and one of the greatest of his time is almost lost sight of. His surgery, however, has been preserved for us by one of his students. During his residence in Madrid as physician to King Philip of Spain he was apparently active in the practice of surgery. Unlike the majority of the physicians of that time, he did his surgery himself. As he had worked in anatomy, doing his dissections himself, and learning from first hand information, so he did his surgery. He had raised anatomy to a high plane. In surgery, during his residence in Spain, he did the same thing and was quite instrumental in bringing about the fall of the barber surgeon.

The writings of Vesalius himself, however, are practically all in the field of anatomy. One of his students and probably an assistant, Prospero Borgarutius, feeling keenly that the surgical teachings of Vesalius should not be lost, undertook to preserve them in a book which was published in 1569 by Valgrisius. The book follows the stereotyped form of the surgeries of the time. Written in Latin, the language of medicine, it is divided into seven books as stated in the title. Book one treats of luxations and their replacement; book two fractures and their treatment; book three wounds; book four the treatment of ulcer; book five the subject of tumors; book six of antidotary; and book seven of surgical medicaments.

It is interesting to note that anatomy is not included; but Vesalius had personally written so much and had successfully contradicted the then current Galenic anatomy that it is fair to assume the author considered a chapter on anatomy unnecessary.

One of the most interesting portions of the work is the introduction, part of which tells the story of the publication. Borgarutius says: "Because of this factor it happened that after Hippocrates, Galen, Avicenna, Celsus, and many others of the same type, Andreas Vesalius of Brussels, at one time physician to the king, and a Caesarine, had shown many (new?) things. Some of these are known. Others, because of his untimely death, would be therefore buried, unless they should be published by the industry of someone, especially one of the number that had the greatest opportunity of study with him. Since I, especially, am of this number and since I understood that he was the personification of a kindly heart and if anyone loves such a one let him desire his immortality and as I have realized how much I have been forwarded by the great name of Vesalius whom I have always obeyed as if there were the power of a god in this human. Therefore, I have always avowed this by the immortal gods, that should the opportunity at any time offer itself to me by which I might show the incredible benevolence of that great man, I would follow him by that opportunity most diligently." He then goes on to say that later when Valgrisius suggested the publication of a surgery of Vesalius he grasped the opportunity to pay this great debt and the work as published is the result. This book differs from the majority of those of the time in being but sparsely illustrated. The Vesalius skeletons are shown in connection with fractures and dislocations. The chapter on wounds is illustrated by a reproduction of Brunschwig's arrow extraction and a modification of Gerssdorff's adaptation of the zodiac figure to show various wounds. A few instruments are shown.

Vesalius' correlation of anatomy with clinical surgery and the fact that during his training as an army surgeon he did the work himself are his greatest contributions to surgery; excepting perhaps, his description and diagnosis of abdominal aneurism (1555), even though he believed the arteries carried vital fluid and veins were the only blood circulation organs; and his successful operation for empyema on Don Carlos of Aragon in 1562. In the chapter on tumors he includes abscess, carbuncle, and inflammatory swellings, but differentiates between hidden and surface scirrhus, and in carcinoma advises excision especially in the breast.

Though *The Seven Books of Surgery* is the only written record left us of the clinical life of Vesalius, it is fair to assume that he had a great influence on the surgery of the time, especially as he was able to instill such loyalty in his students and associates. His teaching was sound and his methods logical for the then knowledge.

BOOK REVIEWS

A REVIEW OF NEW BOOKS IN GYNECOLOGY AND OBSTETRICS

By HERBERT M. LITTLE, B.A., M.D., F.A.C.S., Montreal, Canada

IN 1921, the Appleton Publishing Company began issuing a series of gynecological and obstetrical monographs which were to cover the entire field, having as their aim "to satisfy the needs of the man in practice and not those of the undergraduate student of medicine." Several of the first ten volumes to appear have already been reviewed in these pages, and the series is now complete with the five futher volumes herewith reviewed.

The publishers wish it emphasized that the fifteen monographs are obtainable only as a series and will not be sold separately.

I have read these five volumes from cover to cover, with no little interest and with still more mental and professional benefit. Each deals with a separate problem of importance to the practitioner; and it is surprising to note that although many of the questions discussed are touched upon by all these writers, the reader receives the impression that from a practical standpoint there is comparatively little difference in the practice of men of broad experience.

TAUSSIG who deals with *Diseases of the Vulva*[1], has a limited field for discourse; and his characteristic thoroughness from embryology through anatomy and pathology to differential diagnosis of diseases, many of which border on the field of the dermatologist, leaves the average reader aghast at the paucity of his own knowledge compared with that of the author. Unfortunately the illustrations are not in keeping with the letter press and subject matter, being for the most part reproductions of photographs which leave much to be desired.

RUBIN deals with *Symptoms in Gynecology*[2] and divides his monograph into three parts: (1) the etiology of symptoms, (2) the analytical consideration of symptoms, and (3) examination and diagnosis. Stress is laid on the correlation between gynecology and internal medicine, also on the importance of follow-up and team work in group diagnoses.

The main feature of this monograph is, of course, Rubin's well known work on transuterine and transperitoneal insufflation. This particular portion is excellent. That part of the book dealing with the ovaries and ductless glands generally will probably go over the heads of the majority of readers, whether to their disadvantage or not, future years may tell.

The liberal references to Aschner's work do not add to the clarity and, indeed, wherever we are obliged to detour from the author's clear-cut personal experiences we become more or less mired in the by-way. Let it be understood, however, that the book is extremely well worth reading, particularly that part referring to genital bleeding and amenorrhœa, and to sterility. It will surprise the average reader that "in children, gonorrhœal infection is, in reality, a rarity . . . . I hold that in the vast majority of cases, vaginitis is the result of an infectious catarrh similar in nature and, perhaps, in pathogenesis to angina tonsillaris—manifestations of infection by the micrococcus catarrhalis—a secondary invader in the exanthemata of childhood."

CULBERTSON'S *Surgery of the Female Pelvis*[3] is an encyclopædic description of operations on the genital tract from the vulva to the tube and ovary, with casual excursions to the region of the gall bladder. The technique is described in detail, and the illustrations, though not numerous, are well chosen, many being original. The literature quoted is extensive and the references are most complete. Notes on pre-operative preparation and post-operative care are missing. We mark, sympathetically, the sense of appreciation of the important contributions to American gynecology by J. Clarence Webster. Although dealing primarily with the surgical aspect of diseases, the author is sufficiently broad-minded to appreciate the value of radium and gives clearly the broad indications and limitations for both radium and surgery.

THE volume by DAVIS on *Complications of Pregnancy*[4] might well find a place in the bag of any obstetrician who anticipates the prolonged supervision of a labor. It is delightfully written by a master of English, full of unusual clinical observations justified by case reports from the author's wide clinical experience. If a fault must be found, it might be that the bibliography is imperfect in its indefinite association with references in the text.

[1]Diseases of the Vulva. By Frederick Joseph Taussig, A.B., M.D., F.A.C.S. New York and London: D. Appleton and Company, 1923.

[2]Symptoms in Gynecology, Etiology and Interpretation With Notes on Diagnosis. By Isidor Clinton Rubin, M.D., F.A.C.S. New York and London: D. Appleton & Company, 1923.

[3]Surgery of the Female Pelvis. By Carey Culbertson, A.B., M.D., F.A.C.S. New York and London: D. Appleton & Company, 1923.

[4]Complications of Pregnancy. By Edward P. Davis, A.M., M.D., F.A.C.S. New York and London: D. Appleton and Company, 1923.

In the discussion of toxæmia, we find the interesting circumstance recorded that patients who pass through eclampsia and recover and are subsequently thoroughly examined, are found to be in better condition than those who had toxæmia to a considerable extent during pregnancy and escaped eclampsia; the logical inference is that "eclampsia is one of nature's methods of rescuing the woman, sometimes at the expense of the child, in other cases saving both mother and child." The question of blood pressure in toxæmia is thoroughly discussed, as is also the importance of the more delicate urinary and blood examinations. Cæsarean section is not favored; when it is unavoidable, the anæsthetic of choice is ether and oxygen. Placenta prævia is rather radically considered as an ectopic pregnancy, necessitating surgery as urgently as if the ovum were lodged in the tube. In the active treatment of any form of hæmorrhage the possibility of infection must never be overlooked. In cardiac disease, the condition of the heart muscle is the deciding factor, but accurate determination often presents great difficulties. In discussing the effect of intercurrent diseases on pregnancy, the author contributes numerous personal observations which, to my mind, constitute one of the most valuable sections of the book. In the chapter on abortion we read anent the campaign against abortion that "a living wage, decent living conditions, and the ability to accumulate savings are important in encouraging marriage and the production of healthy children with the avoidance of purposeful interruption of pregnancy. Vice and crime are lessened in proportion as healthy early marriage becomes possible . . . . Under our civilization, in many instances economic conditions make early marriage very difficult or impossible. The remedy for this state of affairs lies, not in a large standing army with government control of the population, but in just, decent, and fair economic conditions which make a decent and natural life possible for all"—proper sentiments from a charming gentleman whose one clinical weakness might be expressed as a sublime though largely olfactory faith in the efficacy of iodoform gauze.

The index is complete, and the illustrations, largely from Bumm's work, are very satisfactory.

GELLHORN on *Non-Operative Treatment in Gynecology*[1] furnishes a veritable mine of valuable and essentially practical information. As a text book for practitioners, this monograph would do much in helping to curb the activities of those who, by ill-timed and injudicious operating, have done so much to discredit our specialty.

The opening which deals with history taking and methods of examination, condemns the routine use of the sound and curette and relegates them to their proper place—the scrap heap. A subject later considered under "psychotherapy" where the relation of physician to patient is more fully discussed, might well have been included in this section.

The main work, divided into two large sections dealing first with diagnosis and treatment and secondly with technique, commences with a thorough consideration of disturbances of development. In this chapter we find a discourse on infantilism and asthenia and—rather a novelty in our literature—on the relations of these and other constitutional anomalies to genital function. In this connection I wish to subscribe to the author's statement that "the science of endocrinology is not nearly so fully developed as many enthusiasts would have us believe." The chapter on disturbances of mechanics includes a discussion of the mechanical causes of displacements, the rôle of displacements in coincident pathological conditions, and suggestions for rational treatment, including much in reference to pessaries. The chapter on infections contains the results of the author's exceptionally wide experience in female gonorrhœa and is abundantly filled with definite instructions as to treatment. It contains, also, much of value in connection with pelvic infections from other causes, venereal disease in general, and tuberculosis. Under the heading of new-growths, the diagnosis, life history and treatment of benign and malignant tumors, whether by radium or operations, is presented succinctly, and this chapter is rounded out by valuable instructions in the symptomatic treatment of inoperable carcinoma. There are, further, chapters on disturbances of nutrition, disturbances of function, symptoms of disease, and the treatment of hæmorrhage, amenorrhœa, leucorrhœa, dysmenorrhœa, pruritus, and a wonderful chapter on sterility and obesity.

The section on technique deals with tampons, topical applications, the treatment of endocervicitis, the limited indications for curettage, hydrotherapy, the effect of dry heat, gymnastics, the nasal treatment of dysmenorrhœa, powder treatment of vaginal discharge, and protein therapy, the latter an innovation in American textbooks.

Could one ask a more complete guide to treatment? We doubt it; but the author, conscious, perhaps, of a limitation unsuspected by the reader, has added a chapter on radiation therapy by Henry Schmitz, equally an authority of the first rank in this particular phase of the work.

[1] NON-OPERATIVE TREATMENT IN GYNECOLOGY. By George Gellhorn, M.D., F.A.C.S. New York and London: D. Appleton & Company, 1923.

AMERICAN COLLEGE OF SURGEONS

PLAN FOR THE ORGANIZATION OF A JUNIOR CANDIDATE GROUP

IT has long been felt by the Board of Regents that the American College of Surgeons has failed to make provision whereby its ideals might be imparted and assistance extended to the young prospective surgeon from the time of his interneship through the seven years of practice which he must pursue before he is eligible for Fellowship in the College. These are, in reality, the formative years of his career when the temptation to commercialize his practice is most pronounced. Accordingly, at a recent meeting, it was proposed to organize a Junior Candidate Group which would make it possible for the College to take these men under its wing from the very beginning of their careers. The following plan was adopted:

THE PLAN

I. In establishing a Junior Candidate Group, it is proposed that the candidates be placed on a probationary list as early as two years after graduation, with the understanding that they be acceptable as Fellows *not earlier than seven years after graduation, and subject to the present provision of the filing of one hundred case records as evidence of their professional qualifications;* that the applicants for appointment as candidates shall fill out and sign the same application blank together with the *anti-fee splitting pledge* as is required of all Fellows admitted to the College.

These young men during their probationary period shall file annually, on carefully prepared blanks provided by the College, a summary of their activities for each year of the probationary period. All of these data will be placed on file and become a part of the application papers of the candidate and will have a bearing upon his acceptance at the end of probation as a Fellow of the College.

II. Applicants for membership in this group whose papers have been properly filed and whose applications have been approved, shall be known as Junior Candidates for Fellowship in the American College of Surgeons and shall be termed members of the "Junior Candidate Group of the American College of Surgeons." They shall be eligible for associate affiliation with their respective state or provincial sections or chapters of the College.

III. Any legalized practitioner of medicine who has been graduated from an approved medical school for a minimum period of two years and who expects to specialize in surgery or some branch of surgery may apply for membership in the Junior Candidate Group. A prospective candidate may personally ask to have his name filed in the central office of the College, or such request may be made in his behalf by a member of the medical profession who is in good standing.

IV. If an applicant for enrollment is vouched for by a Fellow of the College, an application blank and declaration of principles shall be forwarded to him, with the request that they be filled out, signed, and returned to the office of the College. His application will then be submitted for consideration at the *first succeeding meeting of his respective state or provincial credentials committee.* If applicant for enrollment is not vouched for by a Fellow of the College, either at the time the request is filed or subsequently by correspondence with the central office, the communication shall be acknowledged and his name submitted for consideration at the first succeeding meeting of his respective *state or provincial credentials committee.* If his name is then approved, the applicant shall be notified that he has been recorded as a member of the Junior Candidate Group for Fellowship in the American College of Surgeons, and will be forwarded the regular application blanks.

V. A junior candidate list will be published each year in which shall be included the names of all those who have qualified for this group. These names shall be classified by years of eligibility for Fellowship under their respective states, provinces, and countries.

VI. Candidates shall be exempt from all fees or dues until admitted to full Fellowship in the American College of Surgeons, when the regulation Fellowship fee of $100 and annual dues of $25 will become due.

VII. Each candidate shall be known as a member of the Junior Candidate Group of the American College of Surgeons.

VIII. A candidate shall remain a member of the Junior Candidate Group while he continues to develop a specialty of surgery and until he is eligible for Fellowship in the College, and has filed acceptable case records as evidence of his surgical qualifications. If for any reason a candidate finally fails to qualify as a Fellow, he shall be notified and dropped from the list of candidates.

IX. The candidate shall be eligible to attend the annual and sectional meetings of the Clinical Congress of the American College of Surgeons. In his private and professional life he shall be required to carry out all of the requirements of the American College of Surgeons with the same degree of fidelity as is expected of the Fellows of the College.

THE ORGANIZATION OF JUDICIARY OR ADVISORY COMMITTEES IN THE STATES AND PROVINCES

THE selection in each State and Province of an Advisory or Judiciary Committee on Local Affairs of from three to five members has been authorized, such committees to be selected by the Fellows of the College at the time of the State or Provincial sectional meeting, each committee to elect its own chairman.

When complaints of unethical or other unfavorable conduct on the part of any of the Fellows are filed in the Central Office, the local committee will be notified and asked to make an informal investigation of the rumors, and report findings to the Central Office. The report will be submitted to a Central Judicial Committee. The local Advisory Committee also will be in a position to take initiative where information derogatory to a member is brought before it. The local Advisory Committee should submit all its recommendations to the Central Judicial Committee.

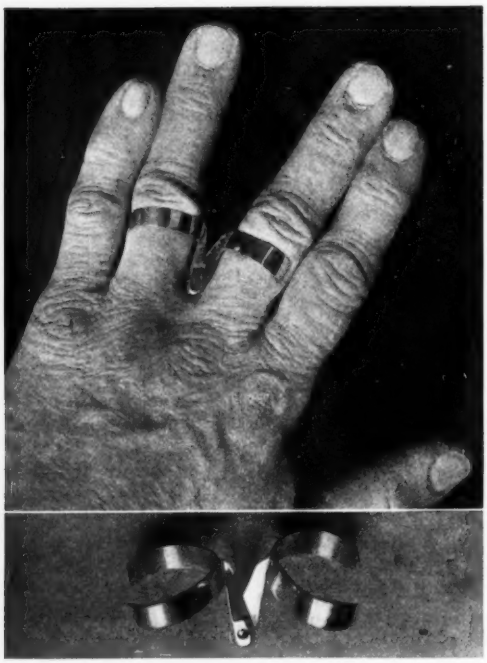
The Central Judicial Committee will be appointed by the Board of Regents from among the Fellows of the College and will be headed by the Attorney of the College. The Central Committee will meet at least once a year, immediately preceding the annual meeting of the Clinical Congress, to consider carefully all problems that are properly prescribed to it and make its recommendation to the Board of Regents.

A NEW INSTRUMENT TO BE CALLED THE REGISTRY OF BONE SARCOMA SCISSORS

By E. A. CODMAN, M.D., F.A.C.S., Boston

THIS instrument is fully shown in the figures. It consists of the blades of a small pair of scissors with two metal rings welded to the backs of the blades. The metal rings are slipped over the two middle fingers just behind the proximal joints. The surgeon can wear it without hindrance while operating and can cut his ligatures and sutures very readily and so rapidly that the act appears "sleight of hand." Any surgeon can have one made for him by cutting off the ends of a small pair of scissors back of the screw, and having rings of brass or German silver welded on the backs of the points. I believe this instrument will be widely used and although slight details may be changed the principle of using minute scissors in the clefts between the fingers is likely to survive. It is intended to have a number of these instruments made up and stamped with the words "Registry of Bone Sarcoma." If any surgeon wishes to try one, I will gladly order one for him at cost.

We all want to contribute our bits to surgical technique and to surgical science. This is my bit, for I believe this principle is not in use. So far as I know it is the first cutting instrument to utilize the power of the interossei and lumbricales. It leaves all the ordinary mechanisms of the hand free for other uses. The idea occurred to me from seeing Lower's ingenious thimble device for the same purpose. If this bit survives, I hope the idea of the Registry of Bone Sarcoma will survive with it. I would like to see the instrument become a little mechanical conscience, at least as far as registering cases of bone sarcoma is concerned. It will tell its owner that he should do something for medical science in return for the multitude of



facts and appliances which medical science daily permits him to use.

It is my hope in presenting this instrument to the profession that it will become the fashion to make it socially uncomfortable for any surgeon who is found using this appliance, if he has not recorded his cases of bone sarcoma to the best of his ability. He must be "jollied" into registering or "jollied" out of using the scissors.

Partly to control the name of the instrument and partly to make a fortune out of it, should its use extend to industry and to the household sewing basket, a patent has been applied for. I am much more likely to make a fortune from this patent than I am from my knowledge of bone sarcoma, for I have repeatedly stated that I shall never make any charges for seeing in consultation patients with this condition. When my ship comes in and all the surgeons in the United States are reporting their cases, I shall be able to write a beautifully illustrated book on "The Registered Cases of Bone Sarcoma."

A description of the object of the Registry of Bone Sarcoma may be found in SURGERY, GYNECOLOGY AND OBSTETRICS, March 1922, pages 335-343, and another paper describing its method of procedure is now in press and will soon appear in the same journal.

STATE MEETINGS OF THE CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

VIRGINIA AND WEST VIRGINIA; PENNSYLVANIA, NEW JERSEY, AND DELAWARE; MASSACHUSETTS, RHODE ISLAND, NEW HAMPSHIRE, CONNECTICUT, MAINE, AND VERMONT; AND NEW YORK

THE State Sectional meetings of the Clinical Congress of American College of Surgeons scheduled to meet in the Spring have just recently been completed. The Fellows of the College, the hospital people, and the public were keenly interested in the subjects discussed, and enthusiastic in the carrying out of the program. The following is a brief report of these meetings:

VIRGINIA AND WEST VIRGINIA

1. The Sectional Meeting for Virginia and West Virginia was held in Richmond, Virginia, on May 2 and 3. Headquarters and meetings were at the Jefferson Hotel. Clinics were conducted in the local hospitals. The visiting speakers were Douglas Freeman, Ph.D., Richmond; Dr. John O. Polak, Brooklyn; Dr. Malcolm T. MacEachern, Chicago; Rev. C. B. Moulinier, S.J., Milwaukee; and Dr. Allan Craig, Chicago. Chairman, Dr. J. Shelton Horsley. Chairman of Committee on Arrangements, Dr. Robert C. Bryan.

The State Executive Committees elected for the coming year for Virginia and West Virginia were as follows:

VIRGINIA

Chairman—C. P. Jones, Newport News
Secretary—J. E. Rawls, Suffolk
Counselor—H. H. Trout, Roanoke

WEST VIRGINIA

Chairman—G. C. Schoolfield, Charleston
Secretary—John E. Cannaday, Charleston
Counselor—Hugh G. Nicholson, Charleston

It was decided to hold next year's meeting in Charleston, West Virginia.

PENNSYLVANIA, NEW JERSEY, AND DELAWARE

2. The Sectional Meeting for Pennsylvania, New Jersey, and Delaware was held in Trenton, New Jersey, on May 5 and 6. Headquarters and registration were at the Stacy Trent Hotel. Clinics were conducted in local hospitals. The visiting speakers were Hon. F. W. Donnelly, Trenton; Dr. William Francis Campbell, Brooklyn; Dr. Halton C. Cassidy, Montreal; Rev. C. B. Moulinier, S.J., Milwaukee; Dr. Malcolm T. MacEachern, Chicago; and Dr. Allan Craig, Chicago. Chairman, Dr. B. Van D. Hedges, Plainfield. Chairman of Local Committee on Arrangements, Dr. G. N. J. Sommer, Trenton.

The following State Executive Committees were elected for the coming year:

NEW JERSEY

Chairman—G. N. J. Sommer, Trenton
Secretary—W. W. Brooke, Bayonne
Counselor—James Green, Elizabeth

PENNSYLVANIA

Chairman—W. L. Estes, Bethlehem
Secretary—S. P. Mengel, Wilkes-Barre
Counselor—J. J. Buchanan, Pittsburgh

DELAWARE

Chairman—J. A. Ellegood, Wilmington
Secretary—W. O. LaMotte, Wilmington
Counselor—H. L. Springer, Wilmington

It was decided to hold next year's meeting in Scranton, Pennsylvania.

MASSACHUSETTS, RHODE ISLAND, NEW HAMPSHIRE, CONNECTICUT, MAINE, AND VERMONT

3. The Sectional Meeting for the New England States was held in Providence, Rhode Island, on May 8 and 9. Headquarters, registration, and meetings were at the Providence-Biltmore Hotel. Clinics were conducted at the local hospitals. The visiting speakers were Governor W. S. Flynn, Providence; Dr. W. H. P. Faunce, Providence; Dr. Harry Mock, Chicago; Dr. Henry S. Plummer, Rochester, Minnesota; Dr. Malcolm T. MacEachern, Chicago; Rev. C. B. Moulinier, S.J., Milwaukee; and Dr. Allan Craig, Chicago. Chairman, Dr. John W. Keefe, Providence. Chairman of Local Committee on Arrangements, Dr. Frederic V. Hussey, Providence.

The following committees were elected for the coming year:

MASSACHUSETTS

Chairman—H. G. Stetson, Greenfield
Secretary—E. L. Hunt, Worcester
Counselor—P. E. Truesdale, Fall River

RHODE ISLAND

Chairman—John W. Keefe, Providence
Secretary—Frederic V. Hussey, Providence
Counselor—George A. Matteson, Providence

NEW HAMPSHIRE

Chairman—Ira J. Prouty, Keene
Secretary—James W. Jameson, Concord
Counselor—John H. Gleason, Manchester

CONNECTICUT

Chairman—F. N. Sperry, New Haven
Secretary—Fritz C. Hyde, Greenwich
Counselor—Seldom B. Overlock, Pomfret

MAINE

Chairman—William Bradford, Portland
Secretary—Carl Robinson, Portland
Counselor—E. B. Sanger, Bangor

VERMONT

Chairman—E. T. Brown, Burlington
Secretary—W. W. Townsend, Burlington
Counselor—William Stickney, Rutland

It was decided that next year's Sectional Meeting for the New England States will be held in the state of Connecticut.

NEW YORK

4. The Sectional Meeting for the State of New York was held in Albany on May 12 and 13. Meetings, headquarters, and registration were at the Ten Eyck Hotel. The Public Meeting was held in the Chancellor's Hall of the Education Building in conjunction with the Community Chorus. The visiting speakers were Dr. Harry Mock, Chicago; Dr. Philip D. McMasters, New York City; Rev. J. A. Diekmann, Cincinnati; Dr. Henry S. Plummer, Rochester, Minnesota; Dr. Malcolm T. MacEachern, Chicago; Rev. C. B. Moulinier, S.J., Milwaukee; and Dr. Allan Craig, Chicago. Chairman, Dr. E. M. Stanton, Schenectady. Chairman of Local Committee on Arrangements, Dr. Arthur J. Bedell, Albany.

The following State Executive Committee was elected for the ensuing year:

Chairman—Arthur J. Bedell, Albany
Secretary—Charles W. Hennington, Rochester
Counselor—George F. Chandler, Kingston

It was decided that the next meeting should be held in either Rochester or Binghamton.

CLINICAL CONGRESS OF AMERICAN COLLEGE OF SURGEONS

ALBERT J. OCHSNER, Chicago, *President* CHARLES H. MAYO, Rochester, *President-Elect*
FRANKLIN H. MARTIN, Chicago, *Director-General*

FOURTEENTH ANNUAL SESSION, NEW YORK–BROOKLYN, OCTOBER 20–24, 1924
HEADQUARTERS—THE WALDORF–ASTORIA

NEW YORK COMMITTEE ON ARRANGEMENTS

EUGENE H. POOL, *Chairman*
JOHN A. VIETOR, *Secretary*

Executive Committee

CORNELIUS G. COAKLEY
WILLIAM A. DOWNES
ARTHUR B. DUEL
BENJAMIN P. FARRELL
ALFRED T. OSGOOD
CHARLES H. PECK
ROBERT G. REESE
J. BENTLEY SQUIER
WILLIAM E. STUDDIFORD
GEORGE GRAY WARD, JR.

J. W. BABCOCK
F. W. BANCROFT
J. A. BLAKE
R. W. BOLLING
E. C. BRENNER
W. M. BRICKNER
W. E. CALDWELL
ALEXIS CARREL
M. L. CHARD
J. F. CONNORS
W. G. CRUMP
A. B. DAVIS
E. B. DENCH
JOHN DOUGLAS
J. C. EDGAR
F. C. EDGERTON
C. A. ELSBERG
J. F. ERDMANN
ERNEST FAHNSTOCK
L. K. P. FARRAR
J. H. FOBES
H. W. FRAUENTHAL
N. W. GREEN
J. A. HARTWELL
R. A. HIBBS
W. F. HONAN
L. M. KAHN
E. L. KELLOGG
ARNOLD KNAPP
B. J. LEE
R. LEWISOHN
H. H. M. LYLE
J. M. LYNCH
J. E. MACKENTY
FRANK MATHEWS
C. E. MCDANNALD
C. A. MCWILLIAMS
A. V. MOSCHCOWITZ
ALEXANDER NICOLL
J. R. PAGE
MARTIN REHLING
HENRY ROTH
CARLOS SAVINI
A. E. SELLENINGS
DEWITT STETTEN
G. D. STEWART
ALFRED STILLMAN
B. T. TILTON
P. R. TURNURE
J. B. WALKER
A. O. WHIPPLE
L. R. WILLIAMS

BROOKLYN COMMITTEE ON ARRANGEMENTS

JOHN E. JENNINGS, *Chairman*
THOMAS M. BRENNAN, *Secretary*

Executive Committee

WARREN L. DUFFIELD
EDWIN H. FISKE
RUSSELL S. FOWLER
EMIL GOETSCH
CHARLES A. GORDON
O. PAUL HUMPSTONE
FRANK D. JENNINGS
WILLIAM LINDER
RALPH I. LLOYD
JOHN O. POLAK
NATHANIEL P. RATHBUN
JAQUES C. RUSHMORE
CHARLES E. SCOFIELD

N. J. BLACKWOOD
W. F. CAMPBELL
J. M. DOWNEY
ROGER DURHAM
H. C. FETT
ALEXANDER GILLIGAN
J. GOLUB
J. HAAR
B. D. HARRINGTON
H. H. HECK
A. C. HOLZMAN
H. T. LANGWORTHY
G. I. MILLER
C. D. NAPIER
W. V. PASCUAL
JOHN RANKEN
G. H. REICHERS
V. A. ROBERTSON
E. W. SKELTON
JOSEPH TENOPYR

PRELIMINARY PROGRAM FOR NEW YORK–BROOKLYN MEETING

IN the following pages is presented a preliminary program of the clinics and demonstrations to be given in the hospitals of New York City and Brooklyn during the fourteenth annual session of the Clinical Congress of the American College of Surgeons. The program as published is a tentative one and is to be revised and greatly amplified previous to the meeting so that the final program will completely represent the clinical activities in all departments of surgery of Greater New York.

Clinical demonstrations or "dry clinics," in which the surgeons, internists, pathologists, roentgenologists and other specialists will participate, are to form an important feature of the program. Important surgical subjects are to be discussed from all angles, bringing to bear the best thought on these subjects as developed in the several departments of medicine. The real program of the Congress will be issued daily during the session, giving in complete detail a description of the clinics and demonstrations for the following day.

Of great interest to the specialists in ophthalmology, otology, rhinology, and laryngology is a series of clinical demonstrations being developed by the Committee to be given each morning in the Manhattan Eye, Ear and Throat Hospital, New York Eye and Ear Infirmary, Bellevue Hospital and other institutions, so that visiting surgeons who are particularly interested in those departments of surgery may find a full program for each of the four days of the session.

The morning and afternoon hours of Monday and Tuesday are set apart for the annual conference on the hospital standardization program of the College and the problems related thereto. These sessions will be held in the ballroom of the Waldorf-Astoria. The program for the conference will consist of papers and discussions by surgeons, hospital superintendents, nurses, trustees, and others interested in the conduct of hospitals.

The presidential meeting, the first formal session of the Congress, will be held in the ballroom of the Waldorf-Astoria on Monday evening, on which occasion Dr. Charles H. Mayo, the president-elect, will be inaugurated and will deliver the annual address. A feature of that evening's program will be the John B. Murphy oration in surgery to be delivered by Drs. John Hunter and N. D. Royle of Sydney, Australia, the subject being, "A New Operative Procedure in the Treatment of Spastic Paralysis."

The Executive Committee of the Congress has in preparation the programs for scientific meetings on Tuesday and Thursday evenings to be held in the ballroom of the Waldorf-Astoria, and on Wednesday evening in the Academy of Music in Brooklyn. Papers dealing with subjects of interest to the surgeon will be presented by eminent surgeons of the United States and Canada and distinguished visitors from abroad. Also the Committee has in preparation a program for two special meetings to be held in the Empire Room at the Waldorf-Astoria on Tuesday and Thursday evenings when the papers and discussions will deal with subjects of special importance to those interested in the surgical aspects of ophthalmology, otology, rhinology, and laryngology. A complete program for the evening meetings will be published in a later issue of this journal.

The twelfth convocation of the American College of Surgeons will be held on Friday evening in the ballroom of the Waldorf-Astoria when fellowship in the College will be conferred upon a group of American and Canadian surgeons, and honorary fellowships upon foreign guests.

The rule limiting attendance to a number that can be comfortably accommodated at the clinics must necessarily be strictly enforced at this year's meeting. The limit of attendance is based upon the result of a survey of the amphitheatres, lecture rooms, and laboratories in the hospitals and medical schools as to their capacity for accommodating visitors. This plan necessitates registration in advance on the part of all who wish to attend. When the limit of attendance has been reached through advance registration, no further applications will be accepted. Attendance at clinics and demonstrations is controlled by means of special tickets, which plan has proved an efficient means of providing for the distribution of the visiting surgeons among the several clinics and insures against overcrowding, as the number of tickets issued for any clinic is limited to the capacity of the room in which that clinic is given.

General headquarters for the Congress will be established at the Waldorf-Astoria at Thirty-fourth Street and Fifth Avenue, where practically the entire first floor of the Hotel has been reserved for the exclusive use of the Clinical Congress—the Ballroom, Astor Gallery, Myrtle and East Rooms, and other large rooms and foyers adjacent thereto. These rooms provide ample space for the evening meetings, business sessions, registration and ticket bureaus, bulletin rooms, etc.

GENERAL SURGERY, GYNECOLOGY, OBSTETRICS, ORTHOPEDIC, UROLOGY

CLINICS IN NEW YORK HOSPITALS

BELLEVUE HOSPITAL

Tuesday

R. S. HOOKER, A. V. S. LAMBERT, J. A. MCCREERY, and C. J. MCGUIRE, JR.—9. Operations and exhibition of cases of fractures, thoracic surgery, gastric ulcer, and sarcoma of bone.

FREDERICK W. RICE and HAROLD BAILEY—9. Demonstration of obstetrical cases.

FREDERICK C. HOLDEN, ONSLOW A. GORDON, JR., and EDWIN HOLLADAY—9. Illustrative gynecological operations with discussions on the methods of pre- and postoperative care of the patient. Methods of undergraduate and postgraduate teaching.

DOUGLAS SYMMERS—2. Aspects of anthrax.

J. BRECKSTEIN—2. Study of duodenal morphology.

W. J. RENDICH—2. Study of gastric mucosa.

I. SETH HIRSCH—2. Cæcum-colic sphincteric tract.

Wednesday

JOHN A. HARTWELL—9. Operation on upper abdomen with demonstration of incision and methods of drainage.

FREDERICK W. RICE and HAROLD BAILEY—9. Demonstration of obstetrical cases.

HAROLD SANTEE—2. Demonstration of suspension traction and treatment of fractures.

JOSEPH E. KING—2. Exhibition of cases of brain abscess and other neurosurgical cases.

Thursday

T. A. SMITH, EDWIN BEER, and staff—9. Late results of fractures of neck of femur. Late results of perforated gastric and duodenal ulcers.

FREDERICK C. HOLDEN, ONSLOW A. GORDON, JR., and EDWIN HOLLADAY—9. Illustrative gynecological operations with discussions on the methods of pre- and postoperative care of the patient. Methods of undergraduate and postgraduate teaching.

CARL G. BURDICK and staff—2. End-results in fractures in children with poor anatomical reduction. Empyema, methods of treatment and end-results. Plastic surgery, methods and end-results. Purpura hæmorrhagica, thrombocytopenic type. Results of splenectomy.

Friday

GEORGE D. STEWART, JOHN DOUGLAS, A. M. WRIGHT, R. P. WADHAMS, W. H. BARBER and GEORGE A. KOENIG—9. Surgical teaching clinic.

EDWARD KEYES—9. Demonstration of urological cases.

FREDERICK C. HOLDEN, ONSLOW A. GORDON, JR., and EDWIN HOLLADAY—9. Illustrative gynecological operations with discussions on the methods of pre- and postoperative care of the patient. Methods of undergraduate and postgraduate teaching.

RECONSTRUCTION HOSPITAL

JOSEPH A. BLAKE and ASSOCIATES—9, daily. Demonstration of the operation of the clinic for industrial accidents and diseases. Exhibition of cases illustrating methods of treating fractures.

NEW YORK HOSPITAL

Tuesday

CHARLES L. GIBSON—9. Operative clinic; gastroduodenal perforations; end-results in chronic appendicitis.

SEWARD ERDMAN—2. Operative clinic; tumors of the colon; high enterostomy for ileus.

O. S. LOWSLEY and staff—2:30. Kidney operations under paravertebral anæsthesia. Demonstration of interesting postoperative cases. Perineal prostatectomy under sacral and parasacral anæsthesia.

Wednesday

E. H. POOL—9. Thyroid operation. Cases illustrating diagnosis, follow-up, and ante-operative therapy.

JAMES M. HITZROT and CLAY RAY MURRAY—2. Fracture clinic, operations and demonstration of cases.

W. M. WEEDEN—2. Empyema clinic.

O. S. LOWSLEY and staff—2:30. Cystoscopy, pyelography. Demonstration of results of operations under regional anæsthesia.

Thursday

CHARLES L. GIBSON—9. Operative clinic; Harris band; pneumococcus peritonitis.

FREDERIC W. BANCROFT—2. Osteomyelitis operation; theoretic considerations. Follow up.

JOHN A. VIETOR—2. Phlebitis.

O. S. LOWSLEY and staff—2:30. Nephrectomy under paravertebral anæsthesia. Demonstration of interesting pyelograms. Suprapubic prostatectomy under sacral and parasacral anæsthesia.

Friday

E. H. POOL—9. Gastric cases, operations.

PAUL DINEEN—9. Discussion of follow-up.

B. J. LEE—2. Breast operation. Cases illustrating diagnosis of breast lesions. Follow-up cases. Congenital obstructions of bowel.

O. S. LOWSLEY and staff—2:30. Clinic on cancer of the urinary tract, treated by operation and radium and X-ray.

HOSPITAL FOR RUPTURED AND CRIPPLED

Tuesday

ROYAL WHITMAN and staff—8:30. Hospital rounds.

W. B. COLEY, C. J. BURDICK, and staff—8:30. Operative hernia clinic.

ROYAL WHITMAN and staff—1. Demonstration of the abduction treatment for fracture of the neck of the femur, also the reconstruction operation for ununited fracture and for arthritis deformans at the hip.

F. E. ADAIR—2. Demonstration of types of umbilical, femoral, and inguinal herniæ.

Wednesday

J. P. HOGUET and F. E. ADAIR—9. Operative hernia clinic. Demonstration of postoperative cases.

Thursday

PERCY ROBERTS and staff—8:30. Joint operations.

ROYAL WHITMAN and staff—2. Demonstration of the operative treatment of structural scoliosis.

PRESBYTERIAN HOSPITAL

Symposium—Surgery of the Gastro-Intestinal Tract

F. B. St. John and John von Glahn—Hæmorrhage from duodenal ulcer; postmortem studies and a discussion of indications for resection of the pylorus.

A. O. Whipple and Ross Golden—Perforating ulcer of the lesser curvature; X-ray studies and a discussion of indications for radical removal by midgastric resection—Billroth II, Pólya, and the Moynihan operations.

F. B. St. John and A. O. Whipple—Results in radical surgery of the stomach illustrated by follow-up cases.

Ross Golden—Diagnostic points in roentgenology of the stomach and duodenum.

George Draper—Studies in the constitutional make-up of patients with ulcer of the stomach and duodenum.

A. O. Whipple and F. B. St. John—Operative clinic: cases of gastric surgery.

Hugh Auchincloss and A. O. Whipple—Follow-up cases illustrating abdomino-perineal resection for carcinoma of the rectum.

Symposium—Biliary Tract Diseases

Ross Golden—X-ray studies in diseases of the biliary tract.

Ross Golden, Louis Bauman, and A. O. Whipple—Results with calcium tetrabrome phthalein X-ray studies.

A. O. Whipple—Indications for common duct drainage. Follow-up results.

Louis Bauman and D. C. Bull—Liver function tests.

A. O. Whipple—Factors in lowering mortality in biliary tract surgery.

George Draper—Constitutional studies in the diseases of the biliary tract.

A. O. Whipple—Follow-up cases illustrating pancreatic lesions.

Demonstrations

Hugh Auchincloss and Ross Golden—Surgery of the breast and chest. Follow-up results and discussion of X-ray features.

Hugh Auchincloss—Plastic surgery and surgery of hand infections. Follow-up results.

Louis Bauman—Insulin therapy as applied to surgical cases. Discussion of results with calcium tetrabrome phthalein and with liver function tests.

J. Bentley Squier—Urological surgery. Follow-up and operative clinic.

W. B. Parsons, Jr.—Diseases of the thyroid.

J. M. Hanford—Tuberculosis of lymph glands of neck. Cases illustrating follow-up results.

F. T. Van Beuren, Jr.—Acute intestinal obstruction. Discussion of treatment, together with discussion of jejunostomy in relation to ileus.

William Darrach—Fracture clinic.

C. A. Elsberg and Dr. Penfield—Discussion of neurosurgical cases from the standpoint of diagnosis, experimental work, and treatment.

MT. SINAI HOSPITAL

A. A. Berg and staff—General surgical clinic.

Edwin Beer and staff—General surgical clinic.

C. A. Elsberg and staff—General surgical clinic.

A. V. Moschcowitz and staff—General surgical clinic.

P. W. Nathan—Orthopedic clinic.

Leopold Jaches—X-ray demonstrations.

ROOSEVELT HOSPITAL

Tuesday

Charles H. Peck and staff—9. Surgical clinic.
Howard C. Taylor and staff—9. Gynecological clinic.
G. P. Pennoyer and C. W. Lester—12. Surgical laboratory demonstration.
J. M. Steiner—12. X-ray demonstration.

Wednesday

James I. Russell and staff—9. Surgical clinic.
James W. White—12. Surgical laboratory demonstration.
J. M. Steiner—12. X-ray demonstration.

Thursday

Charles H. Peck and staff—9. Surgical clinic.
Howard C. Taylor and staff—9. Gynecological clinic.
E. F. Kilbane—12. Demonstration in urological clinic.

Friday

James I. Russell and staff—9. Surgical clinic.
E. F. Kilbane—12. Demonstration in urological clinic.

NEW YORK POST GRADUATE HOSPITAL

Tuesday

John F. Erdmann—8:30. General surgical clinic.
Edward W. Peterson—2. General surgical clinic.
W. Dannreuther—2. Gynecological clinic.
Charles Ogilvy—4:30. Orthopedic clinic.
F. Carter—4:30. Demonstration of local anæsthesia.

Wednesday

H. D. Furniss—9. Gynecological clinic.
L. J. Unger—10. Demonstration of blood transfusion.
Charles Gordon Heyd—2. General surgical clinic.
James N. West—2. Gynecological clinic.
Charles A. Elsberg—2:30. Neuro-surgical clinic.
B. W. Moffat—4:30. Orthopedic clinic.

Thursday

Fred H. Albee—9. Orthopedic clinic.
J. Bentley Squier—9. Urological clinic.
J. J. Moorhead—2. Traumatic surgery.
E. P. Weigel—4:30. Orthopedic clinic.

Friday

Edward W. Peterson—9. General surgical clinic.
S. W. Bandler—9. Gynecological clinic.
John F. Erdmann—2. General surgical clinic.
Charles Ogilvy—4:30. Orthopedic clinic.
F. Carter—4:30. Demonstration of local anaesthesia

NEW YORK NEUROLOGICAL INSTITUTE

Tuesday

C. A. Elsberg, A. S. Taylor, J. H. Kenyon, and Byron Stookey—9. Operations on the central nervous system.

Wednesday

C. A. Elsberg, A. S. Taylor, J. H. Kenyon, and Byron Stookey—9. Operations on the central nervous system.

Thursday

C. A. Elsberg, A. S. Taylor, J. H. Kenyon, and Byron Stookey—9. Operations on the central nervous system.

ST. LUKE'S HOSPITAL

Tuesday

WALTON MARTIN, WILLIAM A. DOWNES, W. S. SCHLEY, N. W. GREEN, R. W. BOLLING, H. H. M. LYLE, F. S. MATHEWS, JOHN DOUGLAS, M. K. SMITH, and E. D. TRUESDELL—8:30. General surgical clinic.

F. S. MATHEWS and G. M. GOODWIN—10. Goiter cases.

JOHN DOUGLAS—11. Lantern slides demonstrating the diagnosis of subphrenic abscess and collections of fluid below the diaphragm.

Wednesday

WALTON MARTIN, WILLIAM A. DOWNES, W. S. SCHLEY, N. W. GREEN, R. W. BOLLING, H. H. M. LYLE, F. S. MATHEWS, JOHN DOUGLAS, M. K. SMITH, and E. D. TRUESDELL—8:30. General surgical clinic.

M. K. SMITH—10. Fracture clinic.

H. H. M. LYLE—10:30. Disabilities of the hand.

H. G. BUGBEE, F. E. DUBOIS and G. F. HOCH—11:15. Exhibition of postoperative urological cases. Lantern slide talk on urological subjects.

Thursday

WALTON MARTIN, WILLIAM A. DOWNES, W. S. SCHLEY, N. W. GREEN, R. W. BOLLING, H. H. M. LYLE, F. S. MATHEWS, JOHN DOUGLAS, M. K. SMITH and E. D. TRUESDELL—8:30. General surgical clinic.

F. C. WOOD—10:30. Clinical results of radiotherapy.

F. C. WOOD—2:30. Lecture and demonstration on the X-ray plant and methods of measurement of X-rays in the radiotherapeutic department.

Friday

WALTON MARTIN, WILLIAM A. DOWNES, W. S. SCHLEY, N. W. GREEN, R. W. BOLLING, H. H. M. LYLE, F. S. MATHEWS, JOHN DOUGLAS, M. K. SMITH and E. D. TRUESDELL—8:30. General surgical clinic.

T. H. MYERS and associates—2. Orthopedic clinic.

Daily

DR. BROWN. Radiological demonstration.

NEW YORK ORTHOPÆDIC HOSPITAL

Tuesday

STAFF—8. Orthopedic operations.
STAFF—1:30. Out-patient clinic.

Wednesday

STAFF—8. Orthopedic operations.
STAFF—1:30. Out-patient clinic.

Thursday

STAFF—9. General hospital rounds.
STAFF—1:30. Out-patient clinic.

Friday

STAFF—8. Orthopedic operations.
STAFF—1:30. Out-patient clinic.

LINCOLN HOSPITAL

Tuesday

WILLIAM C. WHITE—3. Surgical clinic.

Wednesday

SETH M. MILLIKEN—3. Surgical clinic.

Thursday

PERCY H. WILLIAMS—3. Gynecological clinic.

ST. VINCENT'S HOSPITAL

Tuesday

SIMON J. WALSH, WILLIAM FORD, JOSEPH BRADY, GEORGE R. STUART, and C. J. MACGUIRE, JR.—9. General surgical clinic.

GEORGE DAVID STEWART, ARTHUR M. WRIGHT, ERNEST FAHNESTOCK, RAYMOND P. SULLIVAN, and EDWARD A. KING—2. Surgery of the chest.

Wednesday

RAYMOND P. SULLIVAN—9. Management of cases of hyperthyroidism.

JOHN ASPELL, WALLACE KRUGLER, JOHN MCGRATH, JAMES P. HENNESSEY, AUGUST JAMES RAGGI—2. Uterine displacements.

Thursday

GEORGE DAVID STEWART, ARTHUR M. WRIGHT, ERNEST FAHNESTOCK, RAYMOND P. SULLIVAN, and EDWARD A. KING—9. Abdominal surgery. Gastric cases.

EDWARD L. KEYES—2. Urological surgery.

REGINALD H. SAYRE and WILLIAM DORAN—2. Orthopedic clinic.

LENOX HILL HOSPITAL

FRANZ TOREK and staff. Carcinoma of the mouth.

HERMANN FISCHER and staff. Local anæsthesia in operations on the upper abdomen. Hæmostasis in prostatectomy. Plastic for artificial anus.

DEWITT STETTEN and staff. Cholecystectomy without drainage. Inguinal hernia technique.

CARL EGGERS and staff. Chest suppuration.

GUSTAV SEELIGMANN and staff. Combination of surgery and radium in the treatment of carcinoma of the uterus.

FRANK R. OASTLER and staff. The use of radium at the menopause. The use of X-ray in the treatment of fibroid tumors of the uterus. The advantage of proper blood chemistry in the treatment of hyperemesis gravidarum. The advisability of extreme dissections in the treatment of cystocele and rectocele.

WILLIAM H. STEWART and staff. Latest developments in the roentgenographic examination of the gall bladder and kidney. Some refinements in the roentgenographic diagnosis of fractures of the skull.

GEORGE L. ROHDENBURG and staff. Demonstration of the Kahn test. Salt metabolism in neoplasia. Development of the microcystic ovary.

SKIN AND CANCER HOSPITAL

Tuesday

C. A. MCWILLIAMS. Demonstration of plastic surgery and operations for cancer.

Wednesday

FRANZ TOREK. Demonstration of plastic surgery and operations for cancer.

Thursday

GEORGE SEMKEN. Demonstration of plastic surgery and operations for cancer.

Friday

H. H. M. LYLE. Demonstration of plastic surgery and operations for cancer.

WOMAN'S HOSPITAL

Tuesday

HERMANN GRAD and E. A. BULLARD—9. Gynecological operations.
H. G. BUGBEE and staff—9. Urological clinic.
GEORGE GRAY WARD, JR., and L. K. FARRAR—2. Gynecological operations.
DR. PLAUT—2. Pathological laboratory demonstrations.
W. H. GLAFKE—2:30. Gastro-enterological clinic.

Wednesday

H. E. B. PARDEE—9. Cases of pregnancy complicated with heart disease.
F. A. DORMAN and L. V. LYONS—10. Demonstration of obstetrical ward and delivery room technique.
GEORGE GRAY WARD, JR., and L. K. FARRAR—10. Exhibit of radium cases.
W. T. KENNEDY—10. Radiography of pelvic conditions (Dr. Peterson's technique).
B. H. GOFF—2. History system of the Woman's Hospital.
DR. ALDRIDGE—2. Insufflation clinic.
DR. PLAUT—2. Pathological laboratory demonstrations.
F. A. DORMAN and L. V. LYONS—3. Demonstration of new follow-up system in obstetrics.

Thursday

R. M. RAWLS and W. T. KENNEDY—9. Gynecological operations.
H. G. BUGBEE and staff—9. Urological clinic.
D. BISSELL and B. H. GOFF—2. Gynecological operations.
DR. PLAUT—2. Pathological laboratory demonstrations.
R. E. HERENDEEN—2:30. X-ray diagnosis and therapy.

Friday

HERMANN GRAD and E. A. BULLARD—9. Gynecological operations.
GEORGE GRAY WARD, Jr., and L. K. FARRAR—2. Gynecological operations.
DR. PLAUT—2. Pathological laboratory demonstrations.
W. H. GLAFKE—3:30. Gastro-enterological clinic.

NEW YORK INFIRMARY FOR WOMEN AND CHILDREN

Tuesday

MARIE CHARD—9. Gynecological clinic.
HELEN BALDWIN—9. Medical aspects of surgical cases.
CAROLINE FINLEY—9. Use of endocrines in obstetrics.

Wednesday

MARIE CHARD and EMMA SELKIN-ARONSON—9. General surgery.
ELISE L'ESPERANCE—9. Gross and microscopic pathology.
NANCY JENISON—9. Fluoroscopy of chest and after bismuth meals.
LEE EDWARD—9. Demonstration of obstetrical cases.

Thursday

ELISE L'ESPERANCE—9. X-ray department demonstration.
MARY PUTNAM—9. Surgery in pediatrics.
WILHELMINA RAGLAND—9. Treatment of toxæmias of pregnancy.

Friday

ANNA HUBERT—2. Surgical clinic.
GEORGIA REID—2. Use of Gwathmey method of anæsthesia during labor.

GENERAL MEMORIAL HOSPITAL

Tuesday

W. S. STONE and LLOYD CRAVER—9. Cases of lymphosarcoma, Hodgkin's disease, leukæmia.
W. B. COLEY—9. Cases of long bone sarcoma.

Wednesday

B. J. LEE and FRANK E. ADAIR—9. Cases of various types of mammary carcinoma.
WILLIAM P. HEALY and DR. PULLEN—9. Cases of carcinoma of the uterus and vagina.

Thursday

JAMES EWING—10. Pathological conference, exhibition of interesting specimens of bone tumors.
W. S. STONE and LLOYD CRAVER—10. Discussion of interesting cases for diagnosis and treatment.

Friday

DOUGLAS QUICK and F. JOHNSON—9. Cases of cancer of mouth, lip, and tongue.
WILLIAM P. HEALY and DR. PULLEN—9. Cases of carcinoma of uterus and vagina.

FIFTH AVENUE HOSPITAL

Tuesday

GEORGE W. ROBERTS—9. General surgery.
L. R. KAUFMAN—9. Urology.
WILLIAM F. HONAN—2. General surgery.
ANSON H. BINGHAM—2. Orthopedic surgery.

Wednesday

WALTER GRAY CRUMP—9. General surgery.
LEON S. LOIZEAUX—9. Obstetrical clinic.
WILLIAM F. HONAN—2. General surgery.

Thursday

WILLIAM L. SNEED—9. Orthopedic surgery.
SPRAGUE CARLETON—9. Urology.
WILLIAM H. BISHOP—9. General surgery.
BISSELL PALMER—2. Oral surgery.

Friday

L. R. KAUFMAN—9. Urology.

Daily

T. DRYSDALE BUCHANAN and staff. Demonstrations in anæsthesia.
D. S. D. JESSUP and staff. Conferences in surgical pathology.
LEWIS GREGORY COLE and staff. X-ray demonstrations.

SLOANE HOSPITAL

Gynecological and obstetrical clinics. Demonstrations: Obstetrical and gynecological pathology. Pathological findings in routine autopsies with stillbirths and neonatal deaths. Medical complications occurring in obstetrical hospitals. Pediatrician's problems in obstetrical hospitals. Treatment and end-results of the toxæmias of pregnancy. Fibroids as a complication of obstetrics. End-results of operative procedures on fibroids. End-results of radium and X-ray treatment of fibroids. Some etiological factors in cystocele and rectocele. Hospital rounds and manikin demonstrations of obstetrical operations.

POLYCLINIC HOSPITAL

Tuesday

A. J. QUIMBY—Demonstrations of gastro-intestinal fluoroscopy and roentgen therapy.

J. R. LOSEE—Demonstration of pathological specimens in general and special surgical conditions. Discussion of chemical blood findings in diabetes and kidney diseases in relation to operative hazards.

Wednesday

WILLIAM SHARPE—Discussion of brain injuries and demonstration of operative procedures.

K. W. NEY—Ventricular estimation for determination of intracranial pressure. X-ray demonstration and operative clinic.

A. S. MORROW—Operative clinic with local anæsthesia.

J. P. GRANT—General surgical operations.

C. A. MCWILLIAMS—Discussion of the principles of plastic surgery. Demonstration with patients and lantern slides.

L. D. GAGER—Consideration of the diabetic as a surgical risk.

Thursday

L. J. LADIN—Discussion of extra-uterine pregnancy. Demonstration of the early signs of pregnancy.

C. G. CHILD—Gynecological clinic.

W. WARD—Gynecological clinic.

E. L. KELLOGG, F. C. KELLER, H. R. KUTIL and S. L. CASH—Gastro-intestinal surgery. Operations and discussion of duodenal problems. Bile-tract drainage. Lantern slide demonstration.

Friday

D. A. SINCLAIR, A. R. STEVENS, and DR. REESE—Urological clinic. Topography of the ureter and renal pelvis as outlined by shadowgraph, bougies, ureterograms and pyelograms. Lantern slide demonstration and operations.

FLOWER HOSPITAL

Tuesday

H. B. SAFFORD—9. Obstetrical clinic.

G. W. LUTTON—2. General surgery.

Wednesday

A. L. SORESI—9. Demonstration in Laboratory of Surgical Research.

W. F. HONAN—2. General surgery.

DR. YOULAND—2. Demonstration of unusual cases from the Department of Surgical Pathology.

Thursday

F. M. SMITH—9. General surgery.

A. L. SORESI—2. General surgery.

Friday

J. H. FOBES—9. Gynecological clinic.

SPRAGUE CARLETON—2. Genito-urinary clinic.

O. R. VONBONNEWITZ—2. Rectal surgery.

L. M. POWELL—2. Demonstration: clinical hæmatology.

Daily

Demonstrations: Anæsthesia, local and general; Laboratory of Surgical Research; Departments of Pathology, Hæmatology and Bacteriology; Roentgenology.

METROPOLITAN HOSPITAL

Tuesday

J. H. FOBES and staff—9. Management of pelvic infection in the female. Discussion of the results of curettage in aseptic abortion.

C. B. REED and H. J. FOBES—2:30. Pneumo-ventriculography in hydrocephalus.

C. L. BAGG and RALPH WARD—3:30. Surgical clinic; review of extra-uterine pregnancy.

Wednesday

HENRY SAFFORD—9. Demonstration of fractures of the pelvis complicating pregnancy.

L. S. LOIZEAUX—10. The modern cæsarean operation.

Thursday

J. R. LISA—10. Duodenal ulcer as a complication of pulmonary tuberculosis, autopsy specimens.

G. S. HARRINGTON and staff—2. Compound fractures.

Friday

WILLIAM F. HONAN and staff—10. Demonstrations and operations under the various forms of local, paravertebral, spinal, and splanchnic anæsthesia. Periarterial sympathectomy.

S. CARLETON—2. Urological clinic.

WALLACE B. HOUSE and A. H. BINGHAM—3. Transverse myelitis, neurological and orthopedic clinic.

G. F. RAYNOR, G. G. ORNSTEIN, and M. M. STEINBACH—4. Surgical interference in pulmonary tuberculosis.

CITY HOSPITAL

Tuesday

CHARLES G. CHILD, JR.—11. Gynecological clinic.

HOWARD D. COLLINS—2:30 Abdominal operations.

JAMES PEDERSON—2:30. Genito-urinary clinic.

Wednesday

EDWARD PINKHAM—11. Gynecological clinic.

PARKER SYMS—2:30. General surgical clinic, sacral anæsthesia.

Thursday

LYMAN W. CROSSMAN and JOHN C. VAUGHAN—11. General surgical clinic.

NATHAN W. GREEN—2:30. General surgical clinic, local and spinal anæsthesia.

J. BAYARD CLARK—2:30. Genito-urinary clinic.

Friday

DONALD GORDON and ERNEST A. CAMPBELL—11. Fracture clinic.

ALBERT S. MORROW—2:30. General surgical clinic.

ST. BARTHOLOMEW'S HOSPITAL

Tuesday

J. M. LYNCH—8:30. General surgical clinic.

Wednesday

AUSTIN FLINT—8:30. Gynecological clinic.

A. CRUMP—2. Medico-surgical cases.

Thursday

J. M. LYNCH—9. General surgical clinic.

E. L. KELLOGG—2. General surgical clinic.

BETH ISRAEL HOSPITAL

Tuesday

ISADORE SEFF—9. Paravetebral anæsthesia in empyema.
CHARLES GOODMAN and staff—2. General surgical clinic.
E. MOSCHOWITZ—2. Pathology of appendicitis.
CHARLES GOTTLIEB and DR. TAYLOR—2. Demonstration of interesting roentgenograms.
DR. SCAL—3. Radium treatment in cancer of tongue, goiter, and diseases of tonsils.

Wednesday

RICHARD LEWISOHN—9. Surgical treatment of gastric and duodenal ulcers.
HARRY E. ISAACS—10. Acute hæmorrhagic pancreatitis.
HARRY E. ISAACS and staff—2. General surgical clinic.
RICHARD LEWISOHN and staff—2. General surgical clinic.
M. KAHN—2. Insulin and intarvin in surgical diabetes.
DR. PREISER—2. Fluoroscopy of gastro-intestinal tract.

Thursday

L. J. LADIN—9. Demonstration of early signs of pregnancy. Discussion of extra-uterine pregnancy.
MEYER R. ROBINSON—10. Lantern slide demonstrations of the pathological anatomy of tubal pregnancy.
I. C. RUBIN—11. Diagnostic and therapeutic value of uterine insufflation.
HERMAN LORBER—11. Presentation of cases treated with radium.
L. J. LADIN and staff—2. General surgical clinic.

Friday

ABRAHAM L. WOLBARST—9. Exhibit of wax models demonstrating pathological lesions of the verumontanum and vesical sphincter.

BETH DAVID HOSPITAL

Tuesday

LEO BUERGER—9. Urological clinic.

Wednesday

JULIUS JARCHO—9. Obstetrical clinic.
LEO BUERGER—2. Urological clinic.
CHARLES GOTTLIEB—2. X-ray clinic.

Thursday

L. MILLER KAHN—9. General surgery.
MAX ROSENTHAL—2. Gynecological clinic.

Friday

LOUIS DROSIN—9. Obstetrical clinic.
L. J. LADIN—2. Gynecological clinic.

MISERICORDIA HOSPITAL

FRANCIS E. BUTLER—Orthopedic clinics End-results of operative treatment in poliomyelitis.
JOSEPH A. DEVLIN—Operations on and demonstration of pelvic tumor cases.
ANTHONY H. HARRIGAN—Gall bladder and stomach cases.
EDWARD F. KILBANE—Supernumerary ureters with ectopic openings. Symptomatology, urethral and renal calculi.
WILLIAM W. MAVER. Demonstration by X-ray films of atypical cases.
ROBERT C. SCHLEUSSNER. Casual findings encountered in the routine laboratory examination of appendices.
ALEXANDER H. SCHMITT. Complications of pregnancy and labor, management and end-results.

ROCKEFELLER INSTITUTE

ALEXIS CARREL and ALBERT H. EBELING—Cinematographic demonstration of tissue growth.
JAMES B. MURPHY—Experimental analysis of the action of X-ray on cancer.
WADE H. BROWN, LOUISE B. PEARCE, and C. M. VAN ALLEN—The relation of the thyroid to the malignancy of a transplanted neoplasm.
HIDEYO NOGUCHI—Yellow fever.
PEYTON ROUS—Physiological implications in cholelithiasis.

KNICKERBOCKER HOSPITAL

Wednesday

JOHN DOUGLAS, C. A. FRINK, C. G. BURDICK, J. V. BOHRER, A. S. ARMSTRONG, and G. A. KOENIG—9. End-results of head injuries.

Thursday

JOHN DOUGLAS, C. A. FRINK, C. G. BURDICK, J. V. BOHRER, A. S. ARMSTRONG, and G. A. KOENIG—9. General surgical operations, traumatic and emergency cases.

Friday

JOHN DOUGLAS, C. A. FRINK, C. G. BURDICK, J. V. BOHRER, A. S. ARMSTRONG, and G. A. KOENIG—9. End-results in complicated leg fractures.

FORDHAM HOSPITAL

Tuesday

F. FLYNN and staff—9. General surgery.
A. H. HARRIGAN and staff—2. General surgery.

Wednesday

J. H. KENYON and staff—9. General surgery.
E. R. CUNNIFFE and staff—2. General surgery.
J. H. TELFAIR and staff—2. Obstetrical clinic.

Thursday

ALEXANDER NICOLL and staff—2. General surgery.

Friday

S. W. BOORSTEIN and staff—9. Orthopedic clinic.
R. E. WALSH and staff—2. General surgery.

BRONX HOSPITAL

Tuesday

MAX ROSENTHAL and staff—10. Trachyloplastic operations; hysterectomy, etc.
MARTIN REHLING and staff—2:30. Operations on the kidneys and pelvic organs under local and sacral anæsthesia.

Thursday

A. A. BERG and staff—10. Gastro-enterological clinic.

Friday

H. GRAD and staff—4. Gynecological clinic.

MANHATTAN MATERNITY HOSPITAL

J. C. EDGAR, AUSTIN FLINT, and WILLIAM M. FORD—9, daily. Demonstrations of indoor and outdoor service, history records and filing system, nursing, social service and prenatal methods, operating room technique.

LEBANON HOSPITAL

Tuesday

A. J. RONGY—9. Gynecological clinic.
G. SEELIGMANN—2:30. Gynecological clinic.
RALPH WALDO—2:30. Gynecological clinic.

Wednesday

HENRY ROTH—9:30. Surgical clinic.
L. MILLER KAHN—9:30. Surgical clinic.

Thursday

A. J. RONGY—9. Gynecological clinic.
G. SEELIGMANN—2:30. Gynecological clinic.
RALPH WALDO—2:30. Gynecological clinic.

Friday

HENRY ROTH—9:30. Surgical clinic.
L. MILLER KAHN—9:30. Surgical clinic.

WORKHOUSE HOSPITAL

Wednesday

EDWARD C. BRENNER—9. Gynecological clinic.

Thursday

EDWARD C. BRENNER—9. Diseases of the biliary tract demonstrating the surgical pathology so frequently found in drug addicts hitherto unmentioned in literature.

PENITENTIARY HOSPITAL

Tuesday

EDWARD C. BRENNER—9. Prostatectomies, perineal and suprapubic, under sacral and parasacral anæsthesia.

ITALIAN HOSPITAL

Tuesday

C. SAVINI and V. FANONI—9. General surgery.
V. SELLARO and A. SCATURRO—2. Gynecology.

Wednesday

F. E. PARODI and G. MUNNA—9. General surgery.

Thursday

S. SALADINO and D. VIGGIANO—9. General surgery.
D. PETILLO and M. CASO—2. Genito-urinary clinic.

Friday

V. COCUZZA and C. TOMASULO—9. Gynecology.

BROAD STREET HOSPITAL

WALTER M. BRICKNER, WALTER G. CRUMP, J. RICHARD KEVIN, ROBERT T. MORRIS, WILLIAM SCHROEDER, JR., and RALPH STEWART—Operative demonstrations and bedside clinics in traumatic and general surgery.
MAXIMILIAN STERN—Urologic operations and cystoscopic demonstrations.

FRENCH HOSPITAL

J. P. HOGUET—End-results in gastric surgery.
PERCY R. TURNURE—Results of operative and X-ray treatment in sarcoma of the long bones.

LYING-IN HOSPITAL

STAFF—Obstetrical operations and demonstrations of interesting cases each afternoon.
J. T. GWATHMEY—Demonstration of obstetrical analgesia.
J. R. LOSEE—Demonstration of interesting pathological specimens in the museum.

GOUVERNEUR HOSPITAL

Tuesday

A. E. SELLENINGS—2. Surgical clinic.

Wednesday

W. H. W. KNIPE—2. Demonstration of normal and abnormal obstetrical cases.
L. J. LADIN—3. Gynecological clinic.

Thursday

A. E. SELLENINGS—2. Surgical clinic.

Friday

E. L. KELLOGG—2. Surgical clinic.

ST. MARY'S HOSPITAL

Tuesday

STAFF—9. Malformations and deformities in children. Demonstrations of non-operative cases, specimens, etc.

Friday

STAFF—9. General surgical clinic.

HARLEM HOSPITAL

Wednesday

THOMAS CHERRY—10. Radium in gynecology.
JOHN F. CONNORS—2. Intestinal obstruction.
HENRY S. PASCAL—2. Biliary fistula.

Friday

THOMAS CHERRY and ARTHUR STEIN—10. Gynecological operations and demonstrations.
JOHN F. CONNORS and PERRY S. BOYNTON—2. Treatment of fractures.

HOSPITAL FOR JOINT DISEASES

HENRY W. FRAUENTHAL and associates—Daily clinics showing cases of obliterating endarteritis. Cases of congenital dislocation of the hip cured and under treatment. Cases of detached semi-lunar cartilage in the knee joint cured without operation. Club foot cases cured and under treatment. Cases of infantile paralysis treated by massage, electricity, and muscle education.

ST. MARK'S HOSPITAL

Tuesday

BENJAMIN T. TILTON—3. Surgical clinic.

Wednesday

VICTOR C. PEDERSEN—11. Urological clinic.

Thursday

WILLIAM A. WILSON—11. Urological clinic.

CLINICS IN BROOKLYN HOSPITALS

BROOKLYN HOSPITAL

Tuesday

W. A. SHERWOOD and J. H. LONG—9. General surgical operations.
R. W. WESTBROOK—9. General surgical operations.
MARY H. COMBS—9. Demonstration: Social service department.
N. P. RATHBUN and STAFF—1. Genito-urinary clinic.
G. H. V. HUNTER and DONALD MCKENNA—2. Orthopedic operations.
JOHN E. JENNINGS—2. Dry clinic: cases of chronic duodenitis in relation to biliary infections.
SIDNEY SMITH—3. Demonstration: results of radium in gynecological cases.

Wednesday

JOHN E. JENNINGS and E. K. TANNER—9. Gall bladder surgery.
R. H. POMEROY and STAFF—9. Gynecological and obstetrical clinic.
N. P. RATHBUN and STAFF—9. Diagnostic clinic in urology; cystoscopy; urography; demonstration of ureteral strictures.
RUTH INGRAHAM—2. X-ray demonstration of surgical conditions.

Thursday

W. A. SHERWOOD and J. H. LONG—9. General surgical clinic.
W. H. CARY—9. Demonstration of sterility studies.
G. H. V. HUNTER and DONALD MCKENNA—9. Orthopedic operations.
H. A. FISHER—9. Syphilis therapy clinic; salvarsan; familial syphilis; follow-up system.
N. P. RATHBUN and STAFF—1. Genito-urinary clinic.
CALVIN B. COULTER—2. Demonstration of pathological material.
W. H. FIELD—2. Diagnostic clinic, general surgery.

Friday

JOHN E. JENNINGS and E. K. TANNER—9. Operative clinic: surgery of the thyroid.
N. P. RATHBUN and W. F. MCKENNA—9. Urological operations.
W. A. SHERWOOD and STAFF—11. Surgical staff conference (review of the work of the previous week.)
W. A. SHERWOOD and STAFF—2. Diagnostic clinic: surgical out-patient department.

LONG ISLAND COLLEGE HOSPITAL

Tuesday

JOHN O. POLAK, ALFRED BECK, and STAFF—9. Gynecological and obstetrical clinic.

Wednesday

EMIL GOETSCH—9. Goiter clinic, demonstration of cases.
S. POTTER BARTLEY—9. Fracture clinic.
ROBERT F. BARBER—2. Demonstration of varicose vein cases.

Thursday

JOHN O. POLAK, ALFRED BECK, and STAFF—9. Gynecological and obstetrical clinic.
HENRY H. MORTON, HOMER E. FRASER, and STAFF—3. Genito-urinary clinic.

METHODIST EPISCOPAL HOSPITAL

Tuesday

THOMAS B. SPENCE, HENRY F. GRAHAM, CHARLES H. GOODRICH, and H. T. LANGWORTHY—9. General surgical clinic.
O. P. HUMPSTONE and STAFF—9. Obstetrical clinic.

Wednesday

A. H. BOGART and ROGER DURHAM—9. General surgical clinic.
O. P. HUMPSTONE and STAFF—9. Obstetrical clinic.
E. B. SMITH—9. Pathological conference.
WESLEY H. WALLACE.—9. X-ray treatment.
J. C. GRAHAM—9. Radium treatment.

Thursday

THOMAS B. SPENCE, HENRY F. GRAHAM, CHARLES H. GOODRICH, and H. T. LANGWORTHY—9. General surgical clinic.
O. P. HUMPSTONE and STAFF—9. Obstetrical clinic.
WESLEY H. WALLACE—9. X-ray treatment.
J. C. GRAHAM—9. Radium treatment.

Friday

RUSSELL S. FOWLER and HAROLD K. BELL—9. General surgical clinic.
O. P. HUMPSTONE and STAFF—9. Obstetrical clinic.

KINGS COUNTY HOSPITAL

Tuesday

E. H. FISKE—9. General surgical clinic.
HENRY M. MILLS—10. Demonstration of obstetrical conditions.
HOMER E. FRASER and CHARLES S. COCHRANE—2. Genito-urinary clinic, demonstration of unusual cases.

Wednesday

WILLIAM PFEIFFER—9. Gynecological clinic.
FRANKLIN B. VANWART—2. Demonstration of orthpedic cases and of corrective apparatus.
RALPH C. WILLIAMS—2. Demonstration of orthopedic cases and of corrective apparatus.

Thursday

JOSEPH TENOPYR—9. Demonstration of the treatment of fractures.

Friday

RUSSELL M. ROME—9. General surgical clinic.

U. S. NAVAL HOSPITAL

Tuesday

CAPTAIN NORMAN J. BLACKWOOD and STAFF—10. Genito-urinary diseases.

Thursday

CAPTAIN NORMAN J. BLACKWOOD and STAFF—10. Roentgenological demonstrations.

Friday

CAPTAIN NORMAN J. BLACKWOOD and STAFF—10. Diathermy and electro-therapeutics.

ST. MARY'S HOSPITAL

Tuesday

W. V. Pascual and T. M. Brennan—9. General surgical clinic.
J. G. Williams—12. X-ray therapy, high voltage treatment with demonstration of iontoquantimeter measurement of dosage.

Wednesday

J. R. Kevin and J. P. Murphy—9. General surgical clinic.
J. G. Williams—12. X-ray therapy, high voltage treatment with demonstration of iontoquantimeter measurement of dosage.
R. B. Anderson—2:30. Urological operations under caudal and transsacral anæsthesia.

Thursday

W. V. Pascual and T. M. Brennan—9. General surgical clinic.
J. G. Williams—12. X-ray therapy, high voltage treatment with demonstration of iontoquantimeter measurement of dosage.
V. L. Zimmerman—2. Emergency obstetrical operations.
Surgical Staff—2. Dry clinic, general surgery.

Friday

J. R. Kevin and J. P. Murphy—9. General surgical operations.
J. G. Williams—12. X-ray therapy, high voltage treatment with demonstration of iontoquantimeter measurement of dosage.
J. C. MacEvitt and J. P. Glynn—2. Gynecological clinic.

ST. JOHN'S HOSPITAL

Tuesday

H. Beeckman Delatour—9. General surgery.
Stanley B. Thomas—2. General surgery.

Wednesday

George F. Sammis—9. General surgery.
Alfred W. White—2. Obstetrics.

Thursday

William H. Rankin—9. General surgery.
Harold K. Bell—2. General surgery.

Friday

Warren L. Duffield—9. General surgery.
John C. Knapp—2. Roentgenological demonstrations.

CUMBERLAND HOSPITAL

Tuesday

William L. Heeve—9. General surgical clinic.
William C. Durrin—2. Gynecological clinic.

Wednesday

John F. Ranken—9. General surgical clinic.
Frederick R. Meeks—2. Gynecological clinic.

Thursday

Herbert S. DuCret—9. General surgical clinic.
Marcus F. Searle—2. Gynecological clinic.

Friday

Robert L. Wood and George S. Ogden—9. Obstetrical clinic.

ST. PETER'S HOSPITAL

Tuesday

Joseph F. Todd—8:30. Diagnostic and operative gynecological clinic.
Gordon Gibson—10:30. Diagnostic and operative clinic, "prolapsus uteri."
J. Sturdivant Read—3. Diagnostic and operative urological clinic.

Wednesday

Thomas M. Brennan and Wm. M. Ennis—8:30. Diagnostic and operative clinic, demonstrations.

Thursday

Frederick C. Paffard and James J. Shay—8:30. Diagnostic and operative clinic, surgery of the upper abdomen.
John D. Rushmore and Lorne McD. Ryan—10:30. Diagnostic and operative clinic, general surgery.

Friday

Gordon Gibson—10:30. Diagnostic and operative clinic, "prolapsus uteri."

WYCKOFF HEIGHTS HOSPITAL

Tuesday

John L. Bauer—9. General surgical clinic.
Russell S. Fowler—2. General surgical clinic.

Wednesday

John Horni and Armin J. Sibbel—9. General surgical clinic.
Charles J. Pflug—2. General surgical clinic.

Thursday

John L. Bauer—8. General surgical clinic.
Russell S. Fowler—10. General surgical clinic.
Thurston H. Dexter—2. Pathological conference.
Rudolph F. Herriman—3. Obstetrical clinic.

Friday

John Horni and Armin J. Sibbel—9. General surgical clinic.

BUSHWICK HOSPITAL

Tuesday

W. E. Lippold and M. B. Bergmann—9. Gynecologica clinic, operations.
A. M. Judd or Philip E. Smith—11. Gynecological clinic, operations.
Joseph B. L'Episcopo—2. Orthopedic clinic.

Wednesday

George H. Reichers and A. V. P. Fardelmann—9. General surgical operations.
Nathan Adler, William C. Jayne, or Isidor Teplitz—2. Obstetrical clinic.

Thursday

Russell M. Rome and Hector W. Benoit—9. General surgical operations.
Gerard Kasper and Harry Lipton—11. General surgical operations.

Friday

Richard C. Weithas and George H. Palmer—10. Genito-urinary clinic.

ST. CATHERINE'S HOSPITAL

Tuesday

DANIEL A. MCATEER—9. General surgery.
D. GEORGE BODKIN—10. General surgery.

Wednesday

JOHN F. GRIFFIN—9. Urological clinic.
JOHN M. SCANNELL—9. General surgery; local anæsthesia; demonstration of direct blood transfusion, method, apparatus and technique.
MARTIN L. BODKIN—10. Proctological clinic.
M. E. MARTEN and E. H. NIDISH—2. Pathological demonstration.

Thursday

FRANK D. JENNINGS and D. E. MCMAHON—9. General surgery.
CHARLES A. GORDON, EDWARD A. FLEMMING and JOSEPH A. DRISCOLL—9. Gynecological clinic.

Friday

DANIEL A. MCATEER—9. General surgery.
JOHN M. SCANNELL—9. General surgery; local anæsthesia.
D. GEORGE BODKIN—10. General surgery.

JEWISH HOSPITAL

Tuesday

JOHN LINDER—9. General surgical clinic.
LEO SCHWARTZ—2. Gynecological clinic.
MAX LEDERER—2. Pathological conference.

Wednesday

WILLIAM LINDER—9. General surgical clinic. Demonstration of new methods of local anæsthesia.
ADOLPH BONNER—2. Gynecological clinic.
M. G. WASCH—2. Roentgenological demonstration.

Thursday

JOHN LINDER—9. General surgical clinic.
LEO SCHWARTZ—2. Gynecological clinic.
MAX LEDERER—2. Pathological conference.

Friday

WILLIAM LINDER—9. General surgical clinic.

CONEY ISLAND HOSPITAL

Tuesday

VICTOR A. ROBERTSON—2. General surgical clinic, diagnosis and treatment of the more common fractures, including the application of calipers and Steinmann pin; pre-operative and postoperative study of surgical cases.

Wednesday

JOHN A. SHIELDS—2. Gynecological clinic; diagnosis and treatment of abortion and chronic pelvic infections.

BROOKLYN CANCER RESEARCH HOSPITAL

Tuesday

WILLIAM FRANCIS CAMPBELL, HOWARD T. LANGWORTHY, L. P. VAN WINKLE, and EMIL F KOCH—2. Cancer clinic. Cancer of the bladder, results of radium treatment; roentgen therapy in cancer; methods of typing cancer

PECK MEMORIAL HOSPITAL

Tuesday

JOHN F. RANKEN—9. General surgical and gynecological clinic.
ROBERT WOOD—9. Obstetrical clinic.

Wednesday

WILLIAM PFEIFFER—9. Obstetrical clinic.
GEORGE H. ILER—10. General surgical clinic.

Thursday

THEODORE VOSSELER—9. General surgical clinic.
ONSLOW A. GORDON, JR.—9. Obstetrical clinic.

Friday

CHARLES COCHRANE—9. General surgical clinic.

NORWEGIAN HOSPITAL

Tuesday

E. H. FERRIS—8:30. General surgery.

Wednesday

HENRY F. GRAHAM—8:30. General surgery.

Thursday

E. W. SKELTON—8:30. General surgery.

Friday

LOUIS STORK—8:30. General surgery.

HOLY FAMILY HOSPITAL

Tuesday

JAMES M. DOWNEY—9. General surgical clinic.
EDWARD MORRIS—2. Gynecological clinic.

Wednesday

WILLIAM PFEIFFER—9. Gynecological clinic.

Thursday

EDWIN H. FISKE—9. General surgical clinic.

GREENPOINT HOSPITAL

Tuesday

ANGELO L. SORESI—9. General surgical clinic.

Wednesday

CHARLES A GORDON—9. Gynecological clinic.
JOHN M. SCANNELL—9. General surgical clinic.

Thursday

JOHN M. SCANNELL—9. General surgical clinic.

Friday

CHARLES A. GORDON—9. Gynecological clinic.

HOUSE OF ST. GILES THE CRIPPLE

Thursday

WILLIAM S. HUBBARD, FRANK F. LYNE, CHARLES D. NAPIER, FRANK B. RING, JACQUES C. RUSHMER—3. Demonstration of orthopedic cases.

MIDWOOD SANITARIUM

Tuesday

BURT D. HARRINGTON and CAMERON DUNCAN—10. General surgery and gynecology.

Wednesday

BURT D. HARRINGTON and CAMERON DUNCAN—10. General surgery and gynecology.

Thursday

BURT D. HARRINGTON and CAMERON DUNCAN—10. General surgery and gynecology.

Friday

BURT D. HARRINGTON and CAMERON DUNCAN—10. General surgery and gynecology.

TRINITY HOSPITAL

Thursday

WILLIAM FRANCIS CAMPBELL and HOWARD T. LANGWORTHY—2. General surgical clinic.

UNITY HOSPITAL

Tuesday

A. M. JUDD. Interesting gynecological operations.
ONSLOW GORDON, JR. Operations during pregnancy.

Wednesday

GEORGE I. MILLER. Several cases of blood transfusion. Demonstration of direct blood transfusion instruments. Abdominal operations.

Thursday

RALPH M. BEACH. Interesting gynecological operations.

Friday

GEORGE I. MILLER. Operations on the gastro-intestinal tract. Direct blood transfusion.

ST. CHRISTOPHER'S HOSPITAL

Tuesday

HERBERT C. FETT—8. Orthopedic clinic.

SURGERY OF THE EYE, EAR, NOSE, AND THROAT

CLINICS IN NEW YORK HOSPITALS

NEW YORK EYE AND EAR INFIRMARY

Tuesday

CLYDE E. MCDANNALD, GEORGE H. BELL, CONRAD BERENS, W. B. DOHERTY, W. R. BEDINGFIELD, J. A. RENWICK, KELLY COX, and B. L. MILTON—10. Eye clinic. After-treatment and follow-up.
CONRAD BERENS—10. Lantern slide demonstration of intra-ocular and orbital tumors.
STAFF—10. Otological clinic, rounds, dressings, etc.
GEORGE H. BELL—2. Operations on the eye.
CLYDE E. MCDANNALD—2. Reese resection for strabismus. Reese ptosis operation. Extirpation of lacrimal sac.
CONRAD BERENS—2. Suture in cataract extraction. Pleating muscle operation for strabismus.
ROBERT LEWIS and assistants—2:15. Otological clinic.
T. L. SAUNDERS and assistants—2:15. Otological operations.

Wednesday

ROBERT G. REESE, BEN WITT KEY, AQUIN S. KELLY, C. A. DRAKE, I. D. KRUSKEL, W. B. ALLEN, SHOBER SMITH, KELLY COX, B. L. MILTON, W. B. BEDINGFIELD, and J. A. RENWICK—10. Eye clinic. After-treatment and follow-up.
GEORGE S. DIXON—10. X-ray localization of foreign bodies in the globe.
STAFF—10. Otological clinic, rounds, dressings, etc.
ROBERT G. REESE and AQUIN S. KELLY—2. Cataract extraction in the capsule. Reese resection for strabismus. Reese ptosis operation. Iridectomy under a conjunctival flap for glaucoma. Modified enucleation with gold ball implant. Capsulectomy with Reese knife. Extraction of complicated cataract under a conjunctival flap.
FRED WHITING and assistants—2:15. Otological clinic.
E. B. DENCH—2:15. Otological operations.

Thursday

JOHN M. WHEELER, WEBB W. WEEKS, J. H. DUNNINGTON, R. L. DURFEE, and A. B. REESE—10. Eye clinic. After-treatment and follow-up.
STAFF—10. Otological clinic, rounds, dressings, etc.
JOHN M. WHEELER—2. Operations for contracted orbit and cicatricial ectropion.
WEBB W. WEEKS—2. Trephine for chronic glaucoma. Recession for strabismus.
JOHN MCCOY and assistants—2:15. Otological clinic.
ROBERT LEWIS, JOHN MCCOY, and assistants—2:15. Otological operations.

Friday

FRANCIS W. SHINE, BERNARD SAMUELS, R. L. DURFEE, and A. B. REESE—10. Eye clinic. After treatment and follow up.
B. SAMUELS and M. L. BERLINER—10. Demonstration of Gullstrand slit lamp, Van Hess differential pupilloscope, and Koeppe's eye microscope.
G. S. DIXON—10. Localization of foreign bodies in the globe.
STAFF—10. Otological clinic, rounds, dressings, etc.
F. C. SHINE—2. Motais' operation for ptosis.
BERNARD SAMUELS—2. Reese resection for strabismus. Reese ptosis operation.
C. E. PERKINS and assistants—2:15. Otological clinic.
FREDERICK WHITING, JOHN MCCOY, and assistants—2:15. Otological operations.

CORNELL UNIVERSITY MEDICAL COLLEGE

Tuesday

BERNARD SAMUELS, C. A. DRAKE, and M. L. BERLINER—2. Ophthalmological clinic. Demonstration of Gullstrand slit lamp.

Friday

ROBERT G. REESE and GEORGE W. VANDERGRIFT—2. Ophthalmological clinic.

MANHATTAN EYE, EAR, AND THROAT HOSPITAL

HARMON SMITH, SAMUEL MCCULLAGH, E. ROSS FAULKNER, and JOHN E. MACKENTY—Rhinological and laryngological clinics.
EDGAR THOMSON, CHARLES KINSEY, JOHN SHANNON and HERBERT WOOTTON—Ophthalmological clinics.
ARTHUR DUEL, JOHN PAGE, JOHN REA, and WENDELL PHILLIPS—Otological clinics.
FREDERICK LAW—Roentgenological demonstrations.
GUILFORD ROBINSON—Radium treatment of diseases of eye, ear, nose, and throat.
A. A. EGGSTON—Pathological demonstrations.
C. J. IMPERATORI—The technique of bronchoscopy.
H. A. HOUGHTON—Relationship of metabolism to diseases of the nose, throat and ear.
STAFF—10, daily. Rounds, dressings, demonstration of interesting cases.

CITY HOSPITAL

Wednesday

DANIEL S. DOUGHERTY—2:30. Oto-laryngological clinic, operations and follow up.

Thursday

W. WHITEHEAD GILFILLAN—2:30. Ophthalmological clinic.

Friday

DANIEL H. WIESNER and PERRY BARTLETT HOUGH—2:30. Ophthalmological clinic.

ST. VINCENT'S HOSPITAL

Tuesday

FRANCIS J. QUINLAN—2. Exhibition of nose and throat cases; discussion with view to operation.

Wednesday

JOSEPH O'CONNELL—2. Operations and clinical demonstration of mastoid cases.

METROPOLITAN HOSPITAL

Wednesday

C. C. BOYLE—2. Transplantation of beef cartilage into sclera. Radical mastoid.
J. E. TYTLER—3:30. Rhinological and laryngological clinic.

BETH DAVID HOSPITAL

Tuesday

S. J. KOPETSKY—2. Otological clinic.

FIFTH AVENUE HOSPITAL

Wednesday

L. E. HETRICK—2. Otological clinic.
WESTLEY M. HUNT—2. Rhinological and laryngological clinic.

Friday

DEWAYNE HALLETT—9. Ophthalmological clinic.
HAROLD FOSTER—2. Laryngological clinic.
JOHN W. WHEELER—2. Ophthalmological clinic.

BELLEVUE HOSPITAL

Tuesday

J. D. KERNAN—10. Bronchoscopic treatment of lung abscess versus external surgery with exhibition of technique and presentation of cases.
STAFF—10. Nose and throat clinic. Rounds, dressings, demonstration of interesting cases.
J. WOLFF—10. Eye clinic. After treatment and follow up.
S. A. AGATSTON—2. Eye clinic. Recession operation.
C. G. COAKLEY and associates—2. Ear, nose, and throat clinic.

Wednesday

J. W. FOWLKES—10. Demonstrating the Bellevue method of tonsillectomy and ligation of vessels. Presentation of cases one year after operation showing results.
STAFF—10. Nose and throat clinic. Rounds, dressings, demonstration of interesting cases.
S. AGATSTON—10. Eye clinic. After-treatment and follow-up.
C. G. COAKLEY and associates—2. Ear, nose, and throat clinic.
C. H. MAY—2. Advancement operations.

Thursday

R. T. ATKINS—10. External operations on the paranasal sinuses with presentation of cases.
STAFF—10. Nose and throat clinic. Rounds, dressings, demonstration of interesting cases.
C. H. MAY—10. Eye clinic. After-treatment and follow-up.
C. G. COAKLEY and associates—2. Ear, nose, and throat clinics.
J. WOLFE—2. Cataract extraction with safety flap.

Friday

WESLEY C. BOWERS—10. Radical operation on mastoid with demonstration of improvement of hearing, rather than lessening; persentation of cases.
STAFF—10. Nose and throat clinic. Rounds, dressings, demonstration of interesting cases.
W. B. DOHERTY—10. Eye clinic. After-treatment and follow-up.
W. B. DOHERTY—2. Enucleation with implant of cartilage.
C. G. COAKLEY and associates—2. Ear, nose, and throat clinics.

POLYCLINIC HOSPITAL

Tuesday

F. M. STEPHENS, J. M. SMITH, E. D. NEER, GEORGE E. DAVIS, and E. R. FAULKNER—2. Radical mastoid operation for chronic suppurative mastoiditis. Demonstrations on aural operations on the cadaver. Functional tests of hearing and labyrinthine diseases. Demonstration of sinus operations on the cadaver.

Friday

G. H. BELL, J. A. KEARNEY, and C. E. MCDANNALD—Eye clinic. Demonstration of selected clinical cases and operations.

ST. MARY'S HOSPITAL

Wednesday

STAFF—9. Tonsillectomies.

NEW YORK POST GRADUATE HOSPITAL

Tuesday

T. J. HARRIS—1:30. Nose and throat clinic.
W. C. MCFARLAND—2:30. Ear clinic.
MARTIN COHEN—3:30. Eye clinic. Ptosis operation, Heisrath Khunt operation, extirpation of lachrymal sac, bilateral advancement, Elliot's trephining operation, cataract extraction.

Wednesday

DUNCAN MACPHERSON—1:30. Nose and throat clinic.
R. L. LOUGHRAN—2:30. Ear clinic.
A. E. DAVIS—3:30. Eye clinic.

Thursday

T. J. HARRIS—1:30. Nose and throat clinic.
W. C. MCFARLAND—2:30. Ear clinic.
MARTIN COHEN—3:30. Eye clinic.

Friday

DUNCAN MACPHERSON—1:30. Nose and throat clinic.
R. L. LOUGHRAN—2:30. Ear clinic.
E. M. ALGER—3:30. Eye clinic.

ST. LUKE'S HOSPITAL

Tuesday

E. B. DENCH—2. Ear clinic, demonstration of cases.

Wednesday

A. P. VOISLAWSKY, W. M. HUNT, M. H. MERRIMAN, and L. T. PERRAULT—2:30. Operative nose and throat clinic.

Thursday

A. P. VOISLAWSKY, W. M. HUNT, M. H. MERRIMAN, and L. T. PERRAULT—2. Results of tonsillectomy.
E. B. DENCH and staff—2:15. Otological operations.

LENOX HILL HOSPITAL

RUDOLF C. DENIG and staff. Treatment of fresh eye burns. Operations on the eye.
ERNST F. KRUG and staff. Study of after-cataract cases with the Gullstrand slit-lamp.
FELIX COHN and staff. Oto-laryngological clinic.
JOHN D. KERNAN and staff. Bronchoscopic treatment of lung abscess.

FORDHAM HOSPITAL

Tuesday

CHARLES GRAEF and staff—2. Ophthalmology.

Thursday

W. M. DUNNING, S. H. BASCH, and staff—9. Oto-laryngology.

FLOWER HOSPITAL

Tuesday

L. E. HETRICK—9. Otological clinic.
E. S. MUNSON—2. Ophthalmological clinic.

KNAPP MEMORIAL EYE HOSPITAL

ARNOLD KNAPP and Associates—2, daily. Operations on the eye. Demonstrations of cases.

MT. SINAI HOSPITAL

Tuesday

S. YANKAUER—2. Operative nose and throat clinic, bronchoscopy.

Wednesday

J. WOLFF—2. Cataract extraction with conjunctival safety flap.
K. SCHLIVEK—2. Plastic operation for ectropion.
C. BARNERT—2. Demonstration of block anæsthesia of the ciliary plexus.
I. GOLDSTEIN—2. Extirpation of lacrimal gland.

Thursday

S. YANKAUER and staff—2. Bronchoscopies and œsophagoscopies.

Friday

S. YANKAUER and staff—2. Nose and throat operations.

Day to be announced

ISADORE FRIESNER and staff—Otological clinic.

ITALIAN HOSPITAL

Wednesday

M. LOMBARDO and T. R. PAGANELLI—2. Eye clinic.

Friday

S. LEVY and J. PAGANELLI—2. Ear, nose, and throat clinic.

LEBANON HOSPITAL

Friday

M. D. LEDERMAN and I. M. HELLER—2:30. Oto-laryngological clinic.

GOUVERNEUR HOSPITAL

Tuesday

W. W. CARTER—2. Plastic operations for nasal deformities. Bone transplantation for nasal deformities.

HARLEM HOSPITAL

Thursday

L. M. HUBBY—10. Tonsillectomy. Modified radical mastoid operation.

BETH ISRAEL HOSPITAL

Friday

S. J. KOPETZKY—9. Pathology of middle ear infections.
A. E. SCHWARTZ—10. Cases of labyrinthine disease.
FELIX COHN and staff—2. Oto-laryngological clinic.
S. J. KOPETZKY and staff—3. Otological clinic.

KNICKERBOCKER HOSPITAL

Tuesday

J. EDGAR WELCH—3. Tonsillectomies.

NEW YORK INFIRMARY FOR WOMEN AND CHILDREN

Friday

ANNA BELCHER—2. Nose and throat clinic.

ST. MARK'S HOSPITAL

Thurdsay

G. J. E. TIECK—1:30. Operations for nasal deformities.

CLINICS IN BROOKLYN HOSPITALS

BROOKLYN EYE AND EAR HOSPITAL

Tuesday

FRED D. BAILEY and J. J. MADDEN—2. Demonstration: the Gullstrand lamp and corneal microscope.

Wednesday

GEORGE E. DEELY—2. Operations for squint, cataracts, etc.

Thursday

W. C. BRAISLIN—2. Radical mastoid.

Friday

CLAUDE G. CRANE—2. Demonstration: Barany examination of the ear, with demonstration of cases.

LUTHERAN HOSPITAL

Tuesday

ALEXANDER GILLIGAN—9. Submucous resection of nasal septum, sitting and prone positions, local and general anæsthesia.

Wednesday

ALEXANDER GILLIGAN—9. Tonsillectomy and adenectomy, local and general anæsthesia, Sluder technique.

Thursday

ALEXANDER GILLIGAN—9. Correction of nasal deformities via the columella route.

Friday

ALEXANDER GILLIGAN—9. Exenteration of ethmoid. Puncture and irrigation of maxillary antrum.

BROOKLYN HOSPITAL

Wednesday

C. G. CRANE, F. H. LASHER, and J. M. TAYLOR—1:30. Operative clinic in oto-laryngology. Demonstration of the œsophagoscope and bronchoscope.

CONEY ISLAND HOSPITAL

Thursday

LEFFERTS A. MCCLELLAN—2. Special surgical clinic, devoted to nose and throat operations; removal of tonsils and adenoids.

KINGS COUNTY HOSPITAL

Wednesday

JOHN W. DURKEE—10. Otological clinic; demonstration of unusual ear conditions.

ST. CATHERINE'S HOSPITAL

Tuesday

G. G. FISHER—1. Ear, nose, and throat clinic.

Wednesday

S. H. DECOSTE—1. Ear, nose, and throat clinic.

Thursday

G. G. FISHER—1. Ear, nose, and throat clinic.

Friday

G. G. FISHER—1. Ear, nose, and throat clinic.

WYCKOFF HEIGHTS HOSPITAL

Friday

ROBERT L. MOORHEAD and HARRY MEYERSBURG—2. Nose and throat clinic.

PECK MEMORIAL HOSPITAL

Tuesday

J. ALEXANDER STEWART—11. Nose and throat clinic.

Wednesday

ROYAL A. ABBOTT—9. Nose and throat clinic.

U. S. NAVAL HOSPITAL

Wednesday

CAPTAIN NORMAN J. BLACKWOOD and STAFF—10. Eye, ear, nose, and throat diseases.

ST. PETER'S HOSPITAL

Tuesday

EDWARD R. DORNEY—3. Nose and throat clinic.

HOLY FAMILY HOSPITAL

Friday

GEORGE E. DEELY—9. Ear, nose, and throat clinic.

CUMBERLAND HOSPITAL

Thursday

J. A. STEWART—1:30. Nose and throat clinic.

Friday

ROYAL A. ABBOTT—2. Nose and throat clinic.